POPULAR SCIENCE Monthly

Dec. 1949

25¢

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PAGE 98

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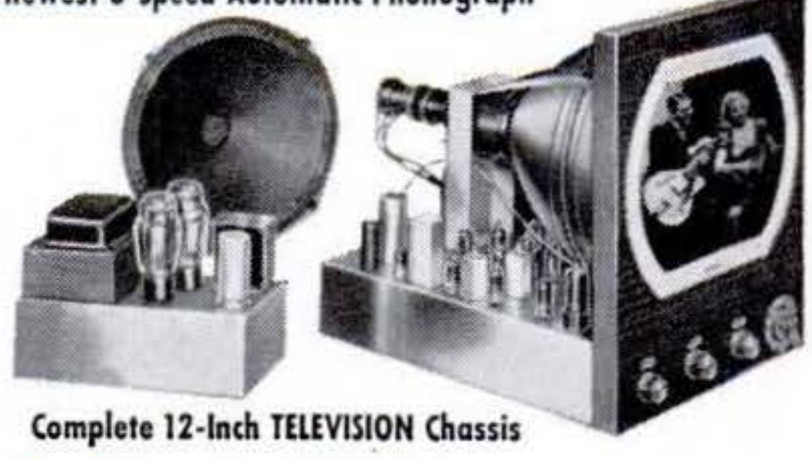

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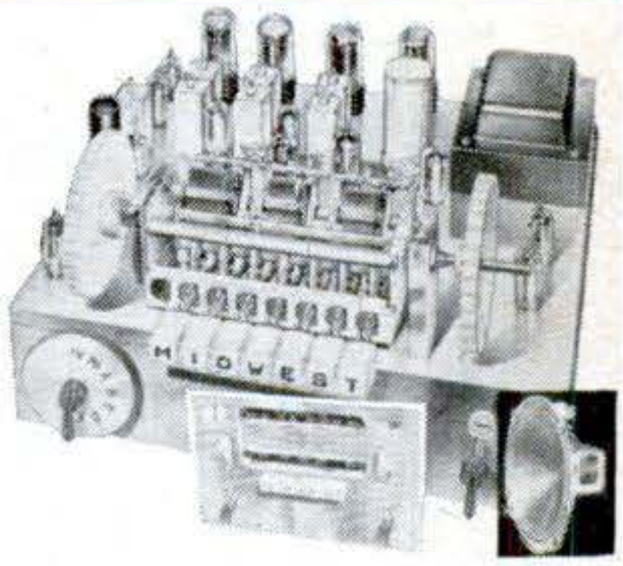

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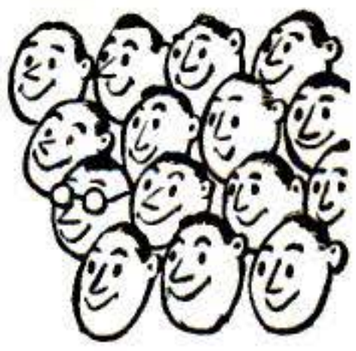

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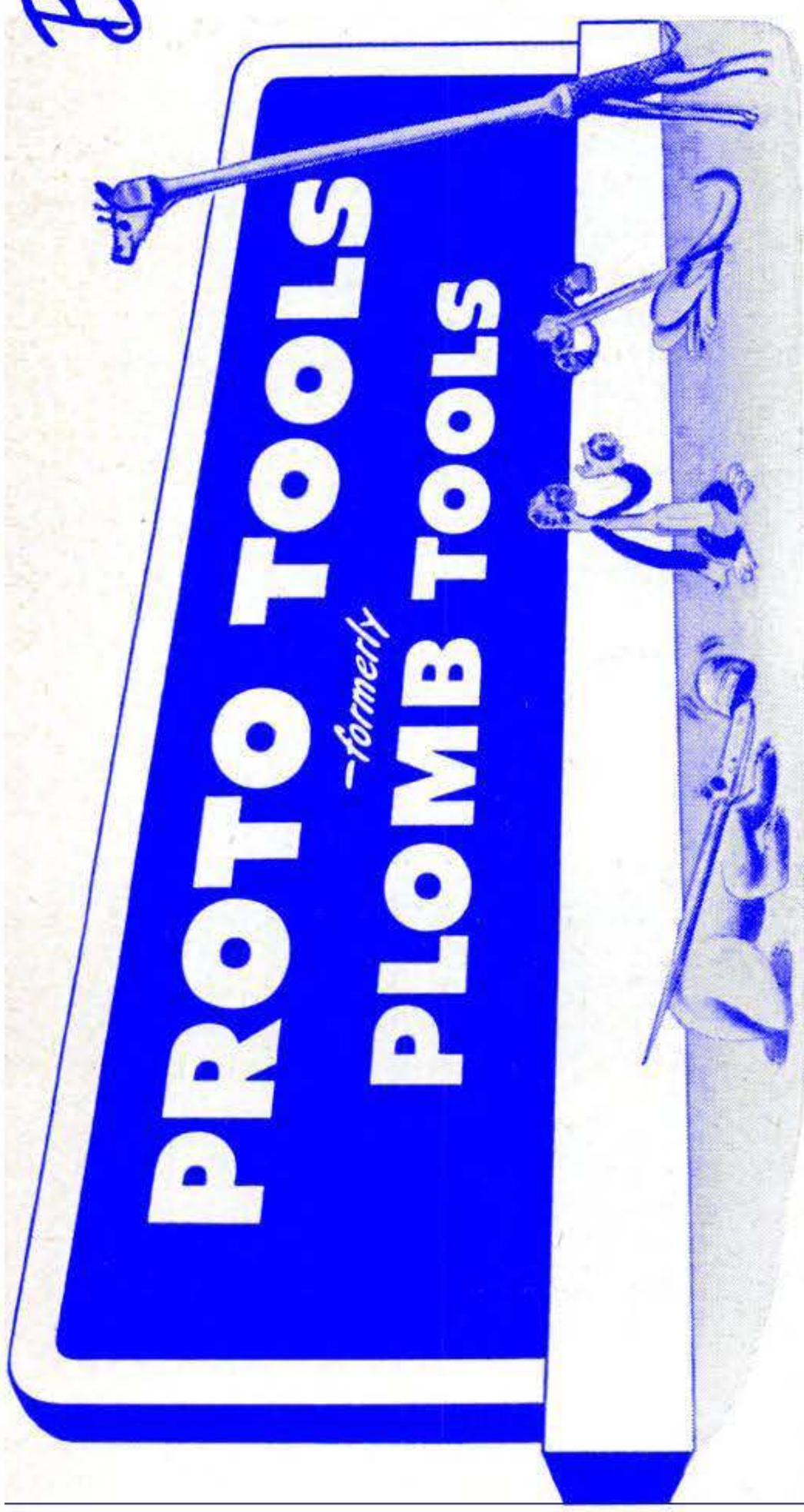

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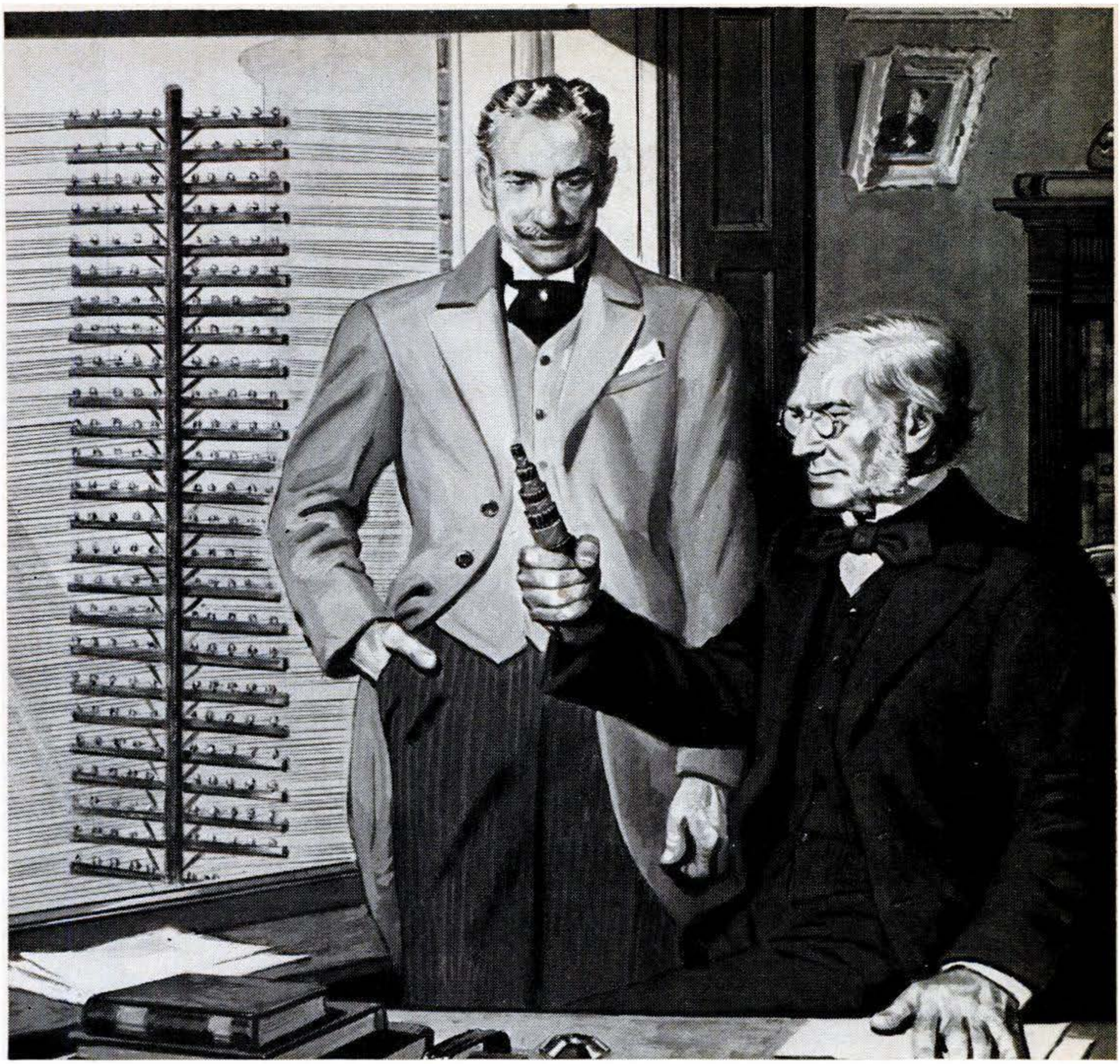

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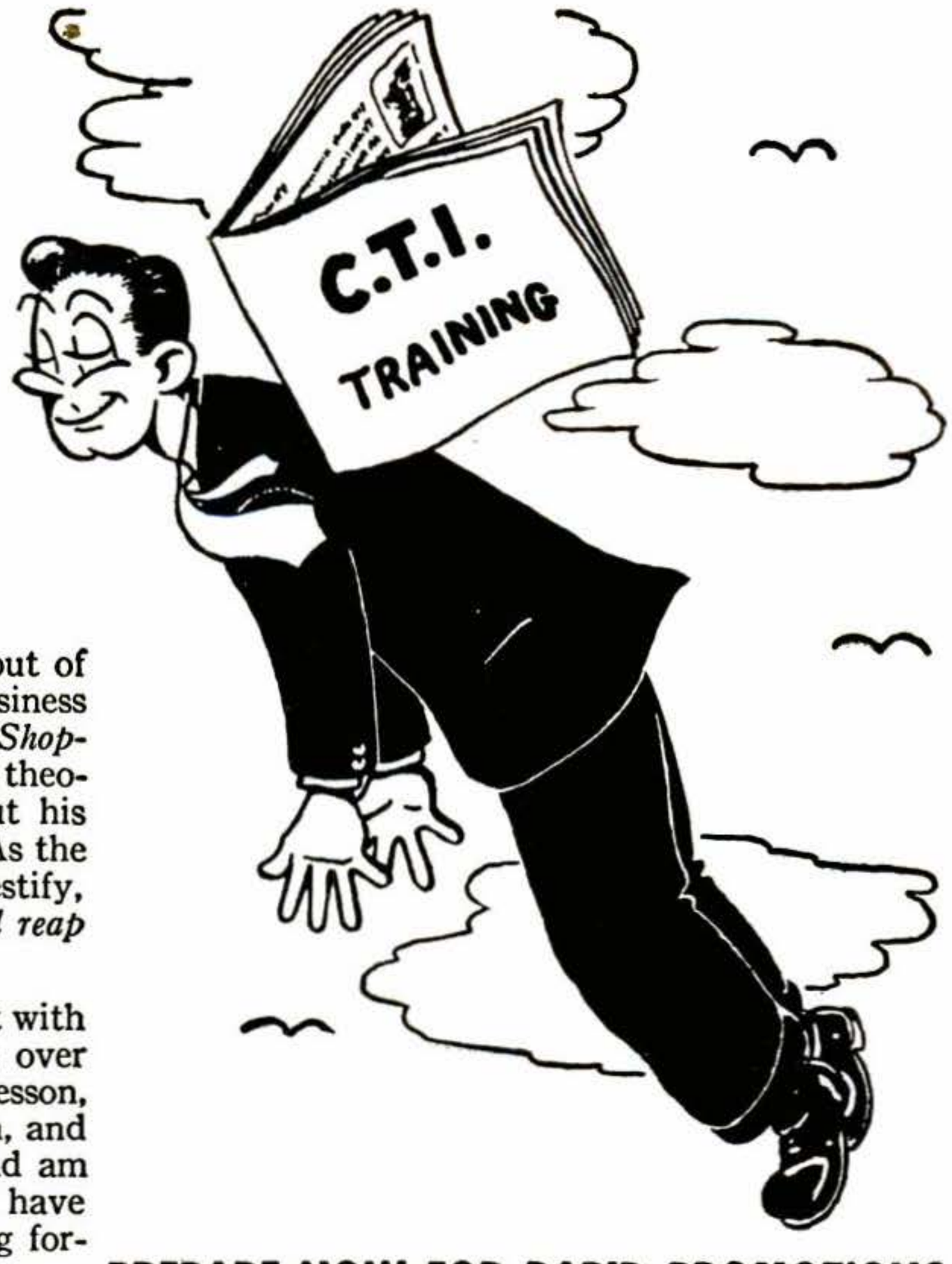

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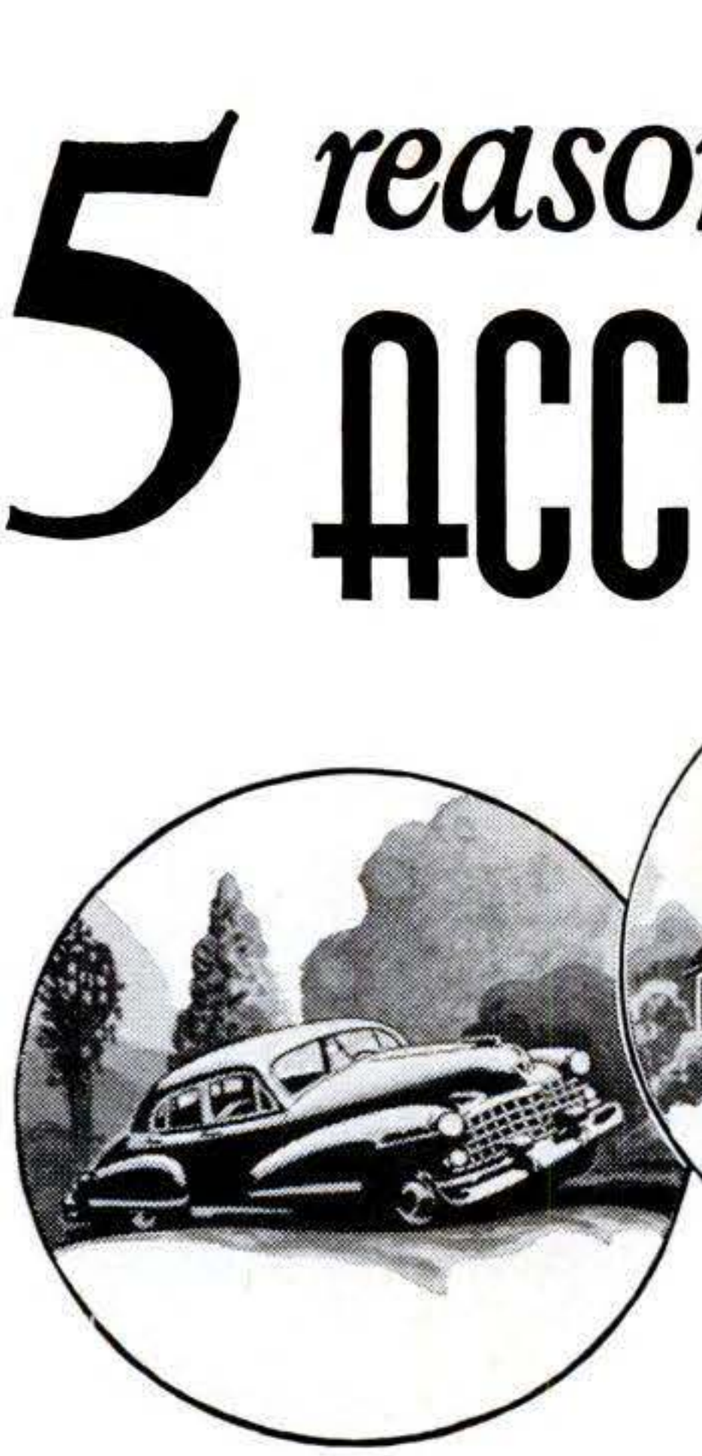

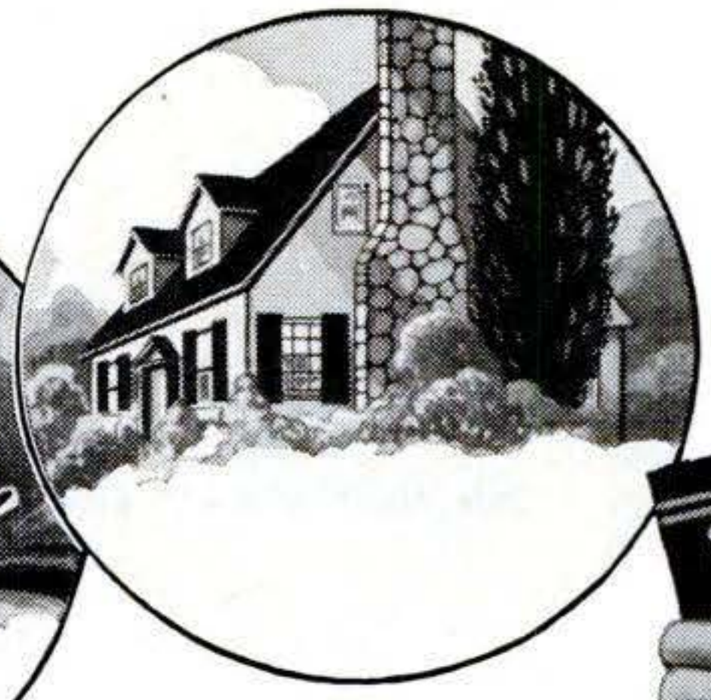

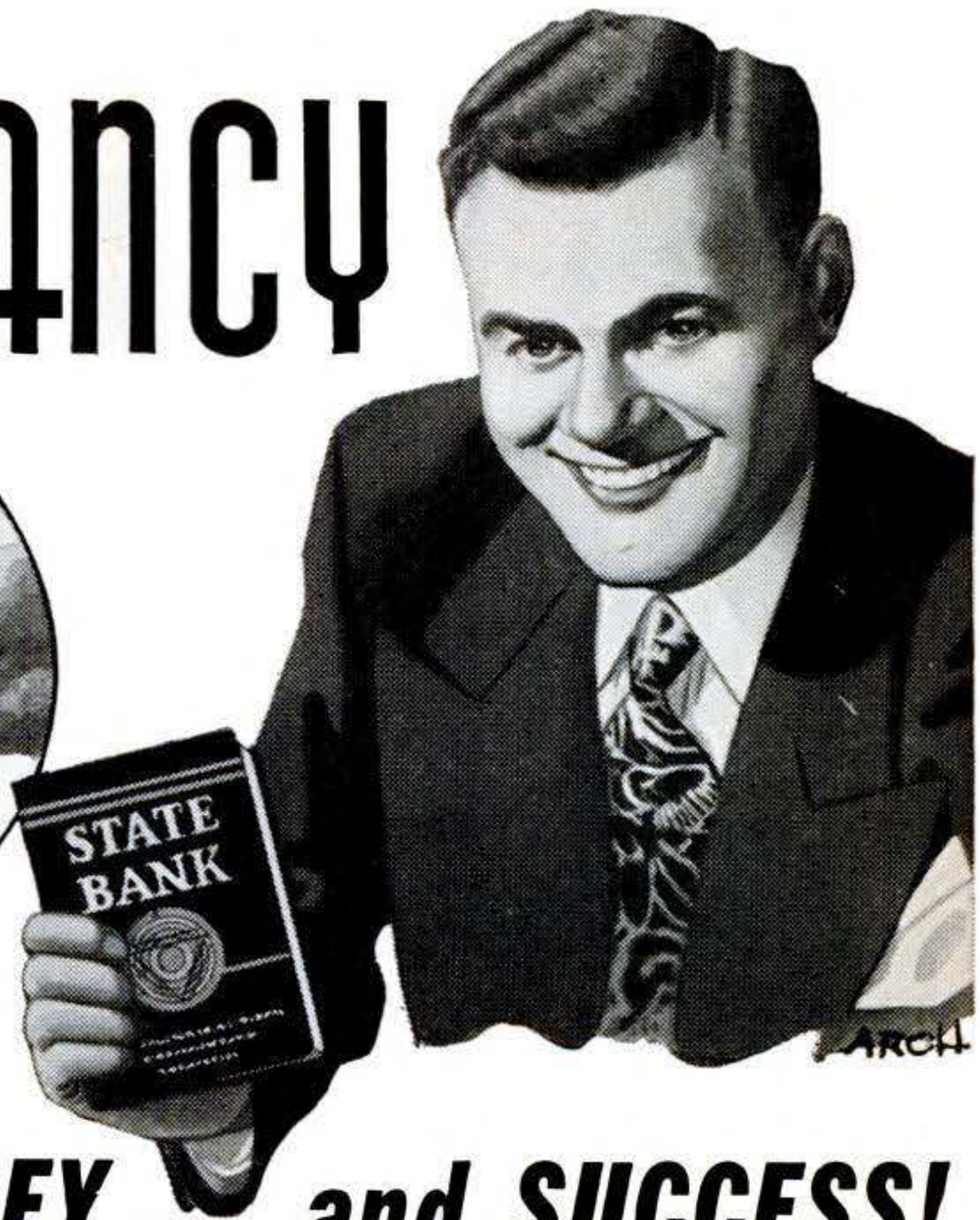

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CASCO Products Corp. Bridgeport 2, Conn.

Letters

Model Garage Hint Saves Money

Sir:

Many thanks for the hint from the Model Garage [Aug., p. 220] about tightening the engine-support rods of a prewar Ford V-8 to correct what sounds like clutch chatter. The tip saved me a big job that I thought was a positive must, to say nothing of the dollars.

GEORGE A. BUTLIN

Stratford, Conn.

No Complaint from the Hogs

Sir:

I am a garbage collector, and I want to know if the new chemical for eliminating garbage-can stink [PS, Oct., p. 302] is poisonous to hogs.

THOMAS L. ALLANDAN

Duncannon, Pa.

Orthobenzylparachlorophenol, marketed by Monsanto Chemical Co. under the name Santophen 1, is not intended for mixing with the garbage but for washing out the cans.

If used as directed, says Monsanto's medical director, Dr. R. E. Kelly, "there will be no complaint from the hogs." His directions: hose out debris and scrub can with the prescribed solution of Santophen 1. Dr. Willem Rudolfs, of Rutgers University, adds the advice that the can then be rinsed. Pigs would probably turn up their noses at garbage containing any of the disinfectant, he says, because it tastes bad.

Biggest Man-Made Lightning

Sir:

The article "New Generator Hurls Life-Size Lightning," on page 130 of your September issue, states that GE's new generator produces the largest and longest bolt of man-made lightning ever produced. If you will read John J. O'Neill's book "Prodigal Genius, The Life of Nikola Tesla," you will find on pages 184-6 the details of this great man's experiments with man-made lightning around 1900. The sparks he produced were 135 feet long. I do not believe

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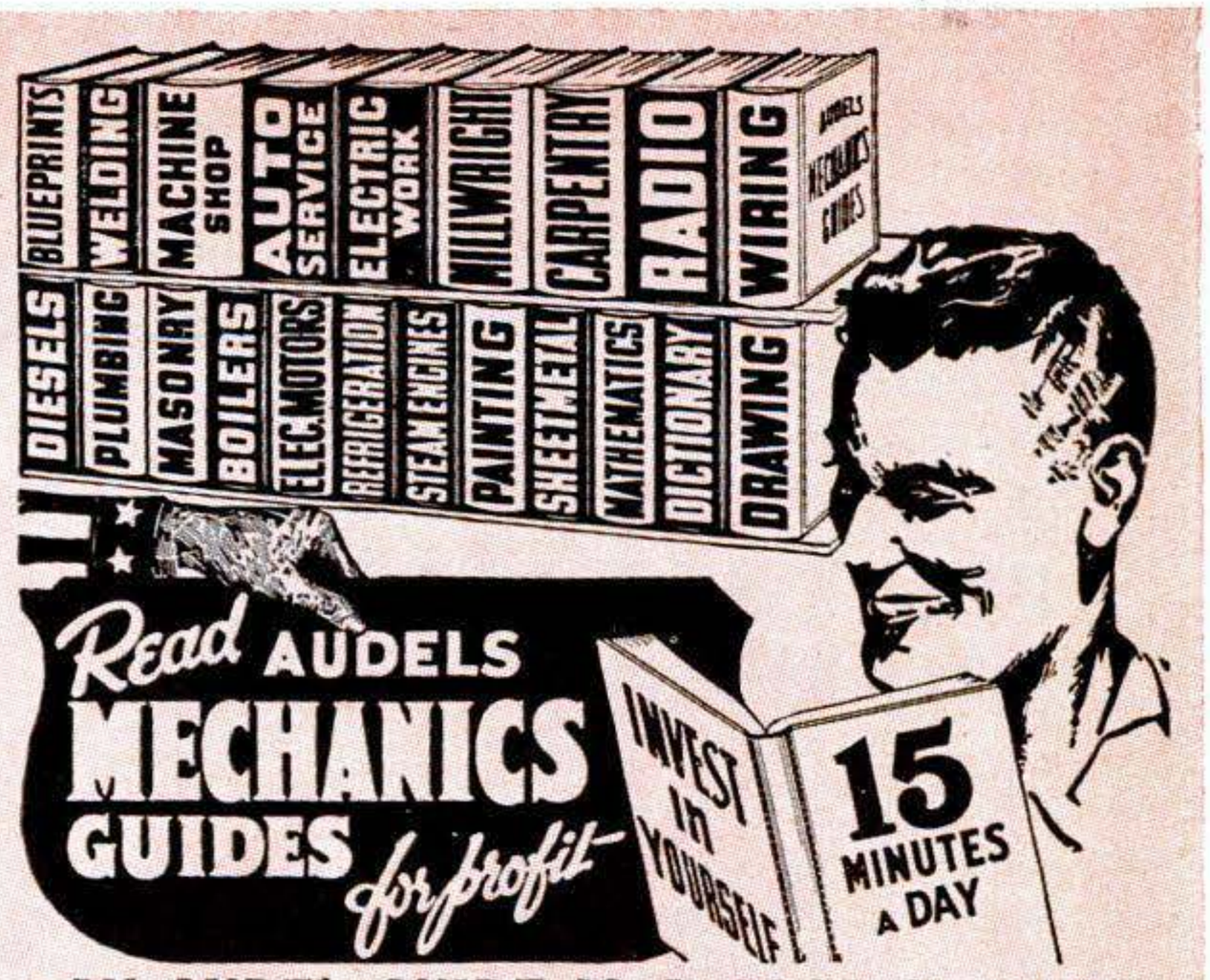

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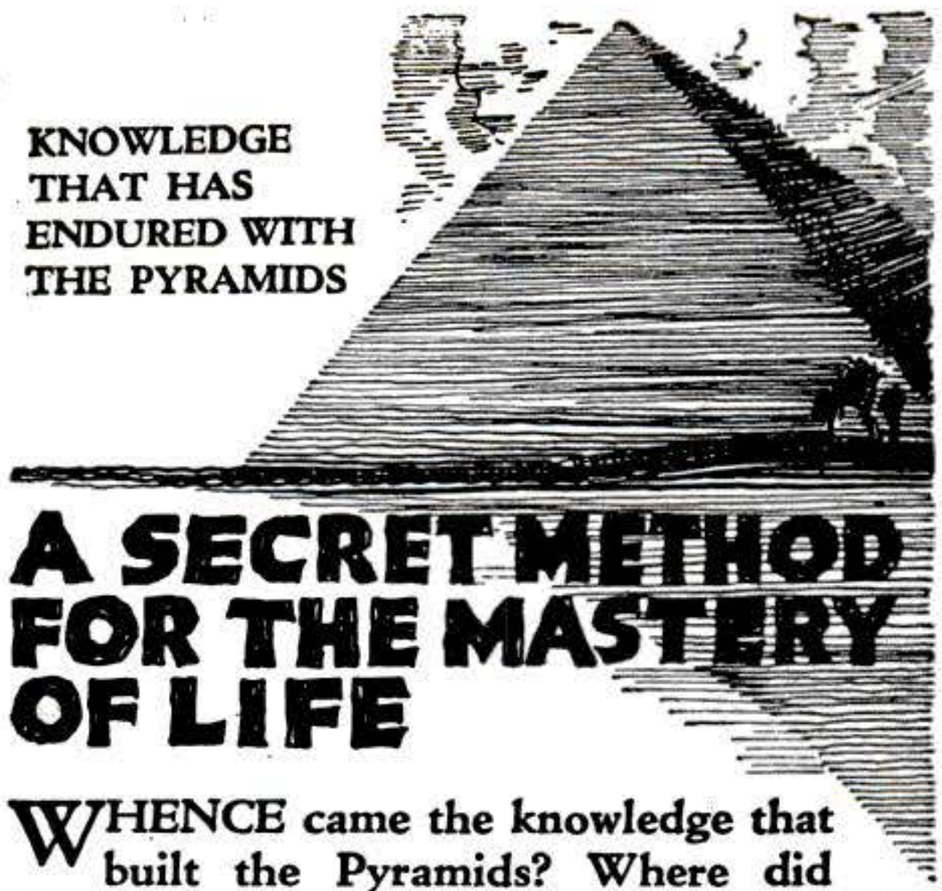

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WHENCE came the knowledge that built the Pyramids? Where did the first builders in the Nile Valley acquire their astounding wisdom that started man on his upward climb? Did their knowledge come from a race now submerged beneath the sea? From what concealed source came the wisdom that produced such characters as Amenhotep IV, Leonardo da Vinci, Isaac Newton, and a host of others?

***Today it is known* that they discovered and used certain *Secret Methods* for the development of their inner power of mind. They truly learned to master life. This secret art of living has been preserved and handed down throughout the ages and today is extended to those who dare use its profound principles to meet and solve the problems of life in these complex times.**

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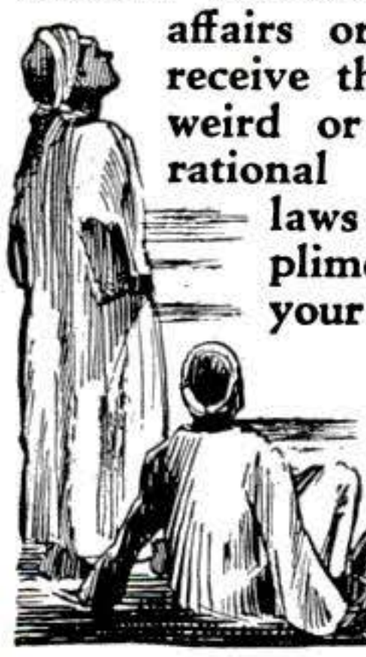

The ROSICRUCIANS
(AMORC)
San Jose, California

the book states the voltage, but it must have been much more than is produced by this new machine.

LAURENCE R. SWAIN, JR.

Braintree, Mass.

The late Nikola Tesla claimed that in 1899 at Colorado Springs, Colo., with a huge Tesla coil of his invention, he built up potentials of "more than 100,000,000 volts" and, from a sphere atop a 200-foot-high mast, "produced electrical discharges the actual path of which, from end to end, was probably more than 100 feet long."

Both a genius and an eccentric, Tesla never made public the evidence and details to support these claims. He once showed our Mr. Armagnac photographs of large sparks (one of which was reproduced in PS, Nov. '28, p. 16), but not of any of the extraordinary dimensions he had described. Preferring to work in secret and to dispense even with ordinary written laboratory records, he unfortunately deprived himself of the usual basis for scientific recognition of such claims.

Make Mine Simple

Sir:

If Mr. Edward Macauley's $200,000 Packard Phantom [PS, Aug., p. 101] is any indication of things to come from Detroit, I will stick to my motor scooter. It has no gear-shifting worries (no transmission), one exhaust stack for each cylinder (one cylinder), and the world's best air-conditioning system (Mother Nature's cooling breezes).

DAVE JOLKOVSKI

Marshfield, Vt.

Lumber's Where You Find It

Sir:

'Way back in July 1937 [p. 71] you published plans for building a 13-foot sailboat. Last year I came across that magazine and decided to build this design. My boat has taken me safely home when others of the same size have capsized and been dismasted. In spite of her low freeboard, she has not dug her bow beneath any waves.

Owing to the timber shortage, I had to change the construction somewhat. I managed to obtain some Douglas fir offcuts for the bottom, but for the deck and sides I used ¼-in. plywood. The stem is of satin walnut that was washed up on the beach.

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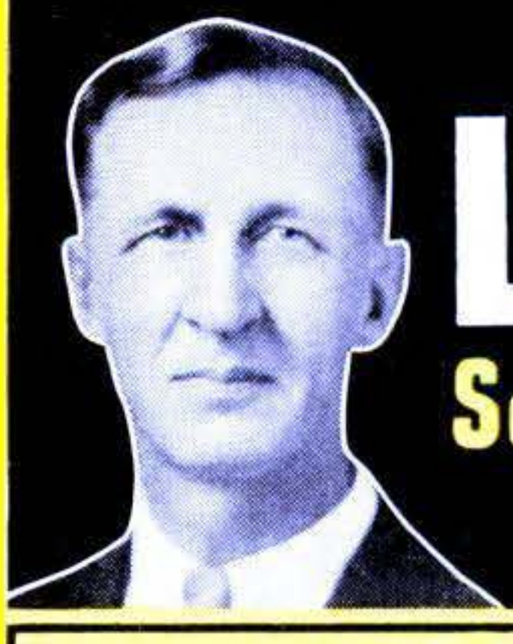

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Servicing or Communications

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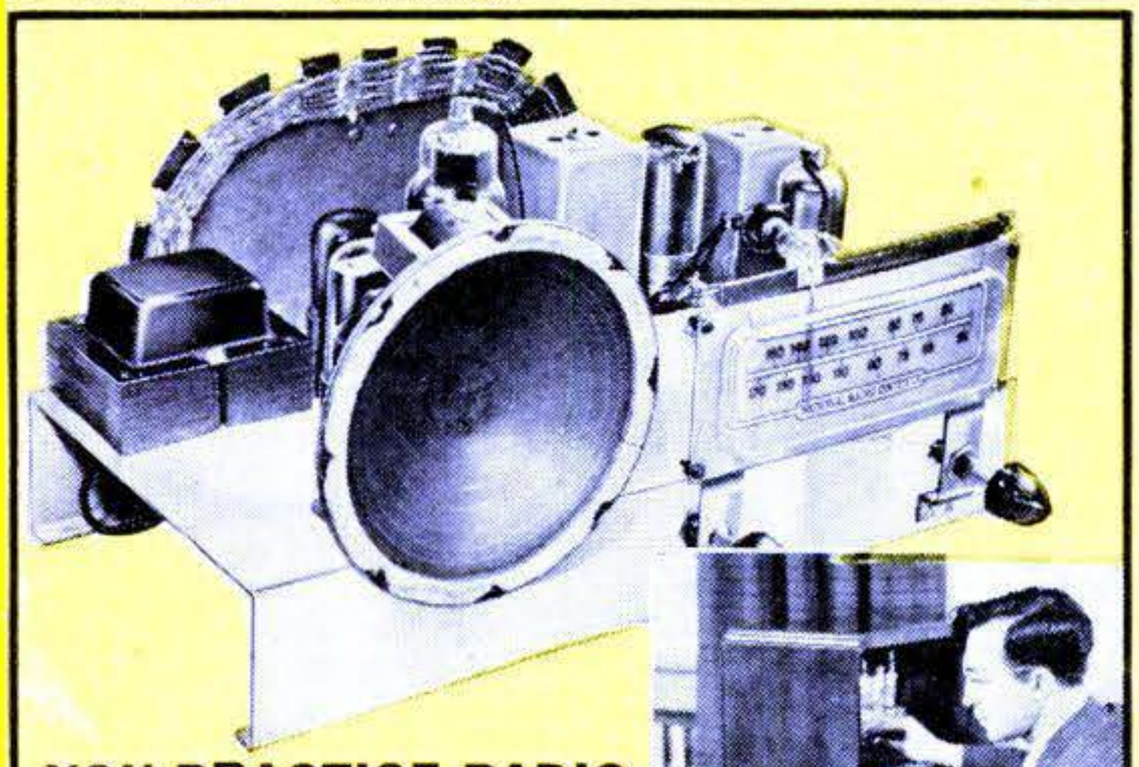

YOU PRACTICE RADIO SERVICING

You build the modern Radio shown below as part of my Servicing Course. I send you the speaker, tubes, chassis, transformer, loop antenna, EVERYTHING you need to build this modern Radio Receiver. Use it to make many tests, get practical experience.

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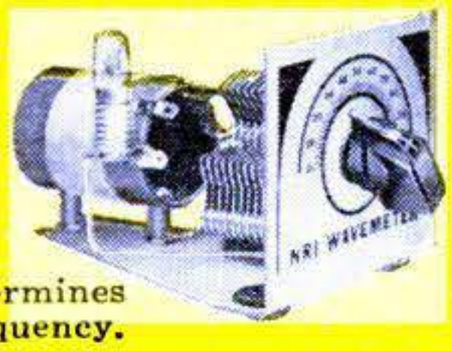
I send you parts to build the Transmitter shown below as part of my new Communications Course. Conduct actual procedure of Broadcast Station Operators, practice interesting experiments, learn how to put a transmitter on the air.

NEW

YOU BUILD THIS TESTER

as part of my Servicing Course. It soon helps you EARN EXTRA MONEY fixing neighbors' Radios in spare time.

BUILD THIS WAVEMETER



as part of my NEW Communications Course. Use it with Oscillator you also build that furnishes basic power to transmitter and determines transmitter frequency.

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Want a good-pay job in the fast-growing Radio and Television Industries, or your own money-making Radio-Television shop? I've trained hundreds of men WITH NO PREVIOUS TRAINING to be Radio technicians. I can do the same for you. Or now you can enroll in my NEW practical course in Radio-Television COMMUNICATIONS—learn to be a Broadcasting and Communications technician. You get practical Radio experience with MANY KITS OF PARTS I send you in my train-at-home method. All equipment yours to keep.

Make Extra Money In Spare Time

As part of my Radio Servicing Course, I send EXTRA MONEY booklets starting the day you enroll. Make extra money fixing Radios in spare time while training. Then start your own Radio sales and service shop or get a good-pay job in Government, Police, Aviation or Marine Radio, Broadcasting, Public Address work, etc. Or think of amazing Television opportunities. Already manufacturers are producing over 100,000 sets a month. New stations going on the air everywhere! Television is America's fastest-growing industry and men who know it will be in demand.

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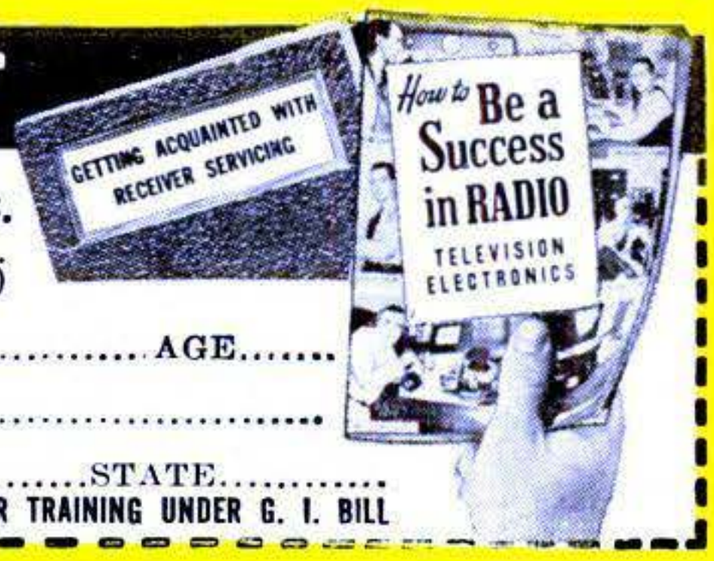
—CLYDE J. BURDETTE, Spartanburg, South Carolina.

HAS HIS OWN RADIO BUSINESS
"Now have two Radio shops servicing about 200 sets a month. Have largest service establishment in Southeastern Missouri."—ARLEY STUDYVIN, DeSoto, Missouri.

MY COURSE INCLUDES TELEVISION

Good for Both-FREE



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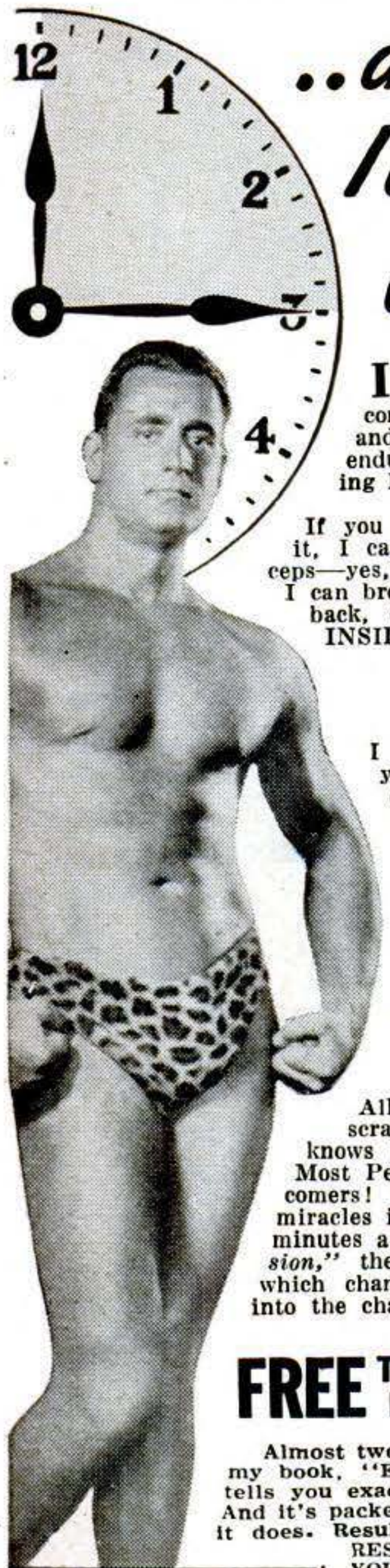

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If you can simply raise your arm and flex it, I can add SOLID MUSCLE to your biceps—yes, on each arm—in double-quick time! I can broaden your shoulders, strengthen your back, develop your whole muscular system INSIDE and OUTSIDE!

What Only 15 Minutes a Day Can Do

I can add inches to your chest, give you a vise-like grip, make those legs of yours lithe and powerful. I can shoot new strength into your old backbone, exercise those inner organs, help you cram your body so full of pep, vigor and red-blooded vitality that you won't feel there's even "standing room" left for weakness and that lazy feeling! Before I get through with you I'll have your whole frame "measured" to a nice, new, beautiful suit of muscle!

I Was a 97-lb Weakling

All the world knows I was ONCE a skinny, scrawny 97-pound weakling. And NOW it knows that I won the title, "The World's Most Perfectly Developed Man." Against all comers! How did I do it? How do I work miracles in the bodies of other men in only 15 minutes a day? The answer is *"Dynamic Tension,"* the amazing method I discovered and which changed me from a 97-pound weakling into the champion you see here!

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Almost two million men have sent for and read my book, "Everlasting Health and Strength." It tells you exactly what *"Dynamic Tension"* can do. And it's packed with pictures that SHOW you what it does. Results it has produced for other men. RESULTS I want to prove it can get for YOU! Learn how you can actually become a NEW MAN, right in the privacy of your own home and in only 15 minutes a day! Mail this coupon NOW! CHARLES ATLAS, Dept. 1-ZY, 115 East 23rd St., New York 10, N. Y.

Charles Atlas

Actual photo of the man who holds the title, "The World's Most Perfectly Developed Man."

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I want the proof that your system of *"Dynamic Tension"* will help make a New Man of me—give me a healthy, husky body and big muscular development. Send me your free book, "Everlasting Health and Strength.

Name.....Age.....
(Please Print or Write Plainly)

Address.....

City.....State.....

The frames and keel are of English oak. Other parts are made of red cedar, mahogany, afzelia, elm, ash, teak, deal, spruce, and birch plywood.

JOHN F. BRIDGES

Yarmouth, England

Wrong Numbers

Sir:

I am curious to know what a 1945 license plate is doing on the 1950 Studebaker pictured on page 99 of your September issue. This is obviously the car used as the model for your cover painting, which shows the plate reading 1949.

RONALD I. RUBY

Passaic, N. J.

Just to show the position of the plate, Studebaker factory mechanics picked up an old one and put it on for the photo. Our cover artist brought it up to date.

Sir:

On page 98, September, you have labeled a 1947 Studebaker as a 1945 model.

ROGER MACK

Hudson, Wis.

Our date was correct—but perhaps confusing. That's when the model was designed.

Does Saw Know When to Stop?

Sir:

On page 115 of the August issue of your fascinating magazine is a short description, complete with picture, of an electric saw for cutting plaster casts that you claim will not affect soft materials such as flesh and cloth. Gentlemen, you lie.

I grant you that the saw does a fine job on the plaster—it tears its way through in a vast hurry, hungry for the tender meat below. It will then gouge long channels down your leg. If you wish proof, I will show you my scars.

It is not much comfort to know that the interne's hand is smouldering gently while he is wrestling with my cast. They quite often have to wrap a towel around the motor so they can hold it. Did you know that?

MARGARET PRENDERGAST

Chicago, Ill.

PS relayed this complaint to a prominent

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Choice of 10, 12½ or 16 inch picture tube

Now you can get this amazingly practical aid for learning Television at home, to help you get started toward FASCINATING WORK . . . GOOD MONEY . . . a THRILLING FUTURE—in a real job, or your own sales and service business. • When you complete our regular home training—described below—you can build and keep a top quality commercial-type Television Receiver. Standardized chassis is adaptable for a 10, 12½ or 16 inch direct view tube that gives big, bright, sharp, steady pictures. This is an optional training advantage—designed to provide the utmost in practical "learn-by-doing" home training in Television. Mail coupon for complete details. See why you owe it to your "Television Future" to enroll for DeForest's Training, Inc.

Mail Coupon NOW for FREE Information!

You also build and keep this Professional Type Equipment

See how D. T. I.'s amazingly effective methods help start you toward a GOOD JOB or your OWN BUSINESS in one of America's most promising fields—including Television, F.M. Radio, Aviation, Train, and Taxi Radio, Broadcast Radio, Industrial Electronics. Get modern lessons . . . plus 16 shipments of Radio-Electronic parts. Work over 300 experiments and projects—including building of (1) commercial-type OSCILLOSCOPE for practical T-V circuit training, (2) double-range R-F SIGNAL GENERATOR, (3) jewel-bearing MULTIMETER, (4) quality 6-tube SUPERHET RADIO. Then build and keep that big new Television Receiver. Here's EVERYTHING YOU NEED for real laboratory type training . . AT HOME!

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Employment Service

* When you complete your training, our effective Employment Service helps you get started toward a real future in Television—Radio—Electronics.

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D. T. I. alone includes the modern, visual training aid . . . MOVIES . . . to help you learn faster, easier at home. See electrons on the march and other fascinating "hidden action"—a remarkable home training advantage that speeds your progress.

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Without obligation, give me complete facts showing how I may make my start in Television-Radio-Electronics.

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orthopaedic surgeon, whose comment follows:

"The Stryker Cast Cutter is very well known in orthopaedic circles. For years a buzz-saw type of electrically driven cast cutter has been sought that will (1) save doctors from excessive-effort dehydration and (2) be less annoying to the patient than are plaster shears. The Stryker is the best one so far developed, but is still far from meeting its more optimistic advertising. The letter writer's criticisms may have been valid. Possibly, the cutter was used by inexperienced hands; or another possibility is that an older type of electric cast cutter was used rather than the Stryker, and the patient did not know the difference when she saw the item in POPULAR SCIENCE."

TV Filter from Your Grocer

Sir:

Your July issue (p. 180) told how a PS reader used an X-ray film as a filter to cut down glare on a television set.

Lacking that, I tried a piece of yellow cellophane wrapping from a loaf of bread, cut to fit the TV screen and taped on. After two months' trial, I declare it a success.

CHARLES P. HERLTH

Redondo Beach, Calif.

Portable With Variations

Sir:

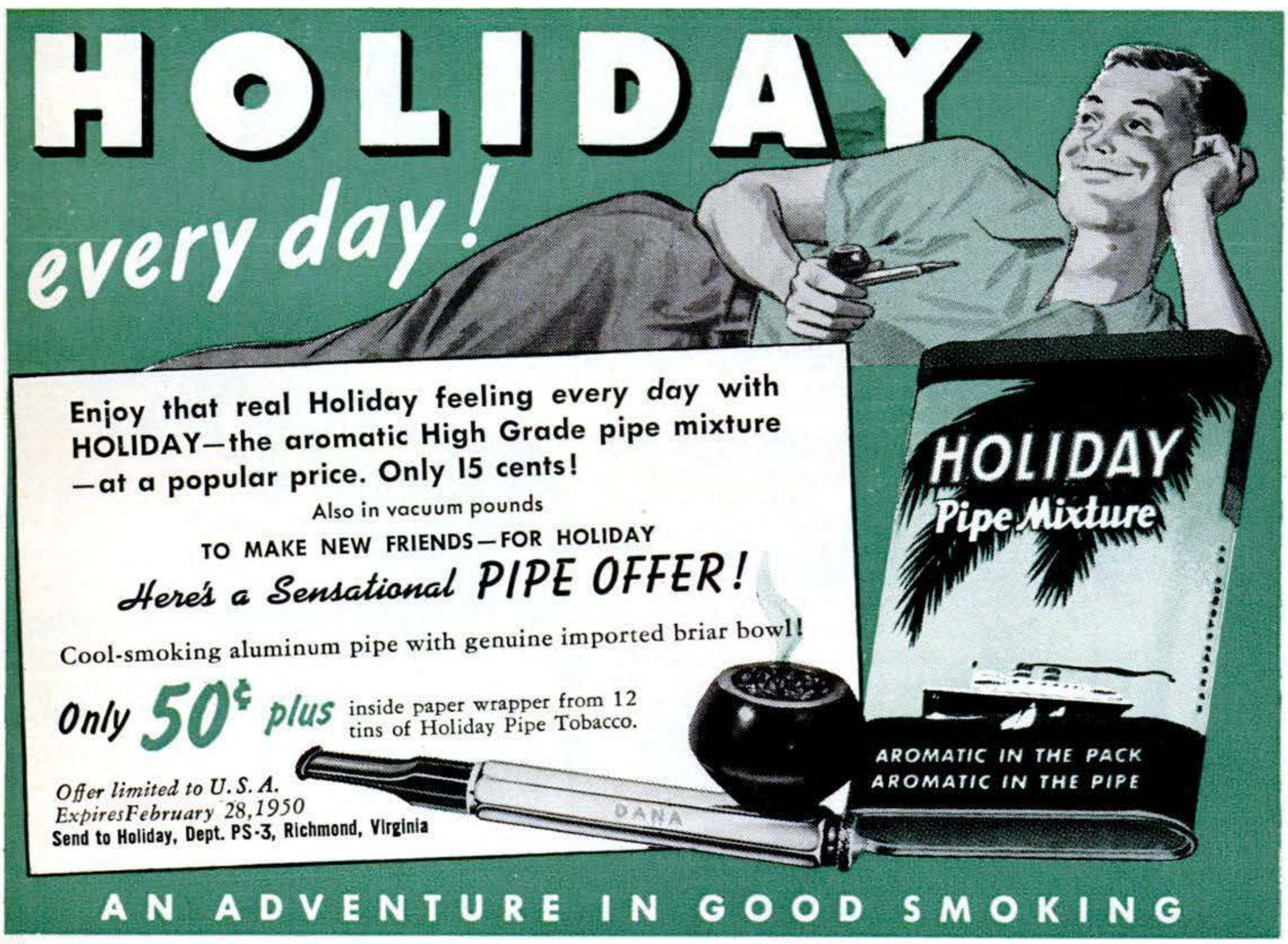
The portable radio I built with the help of your magazine ["Three-Pound Radio," Sept. '48, p. 224] has been performing like a veteran.

Instead of building the cabinet, I obtained an old R.C.A.-Victor suitcase-style case. Since this meant plenty of extra room, I installed a 6-in. speaker and used the bigger telephone-type A battery. With the bigger speaker, this radio far outperforms our 5-tube mantle radio.

I also installed a socket in the back of the case and wired it to the portable B inside, including a toggle switch to cut out the small B. Now I can plug in the bigger type of battery when the radio is not being used as a portable.

H. SHAW

Tilney, Sask., Canada



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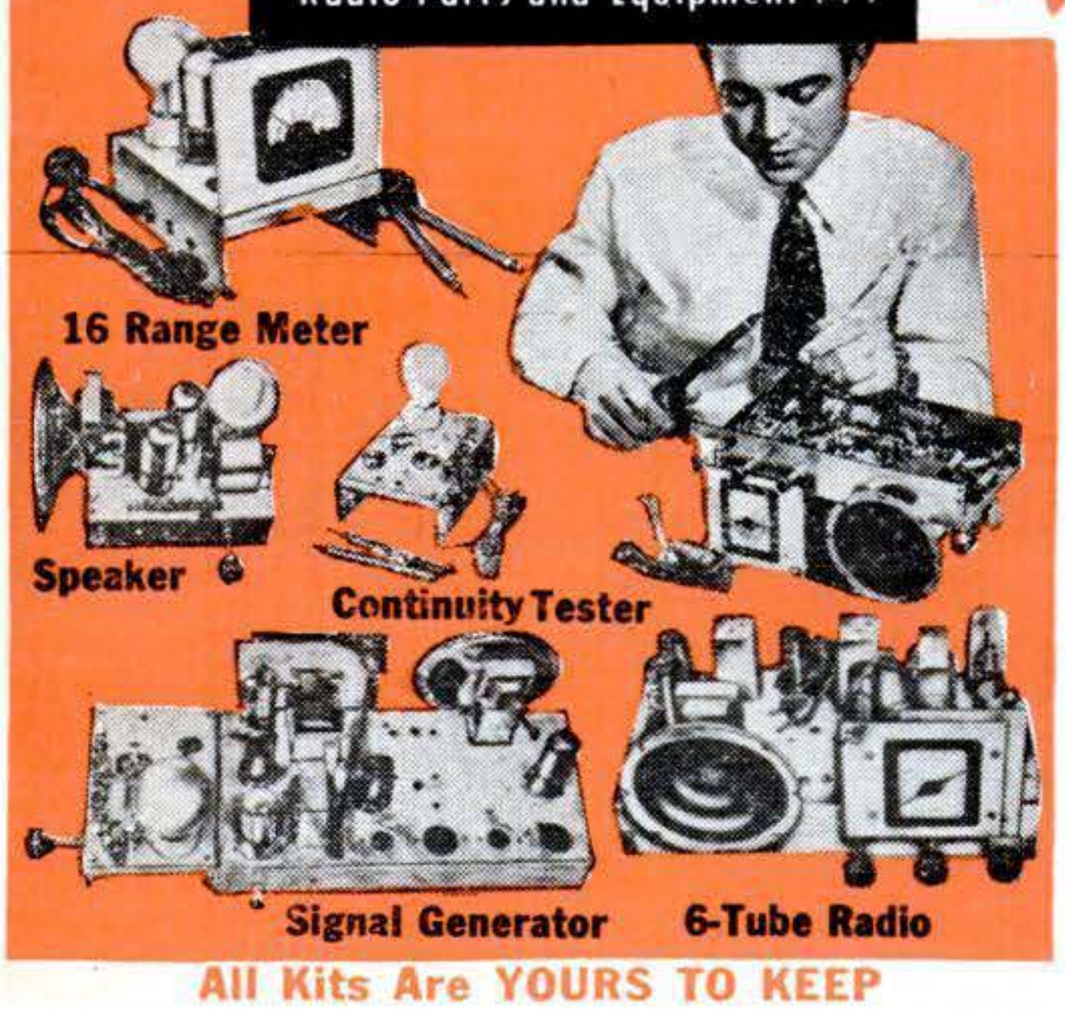

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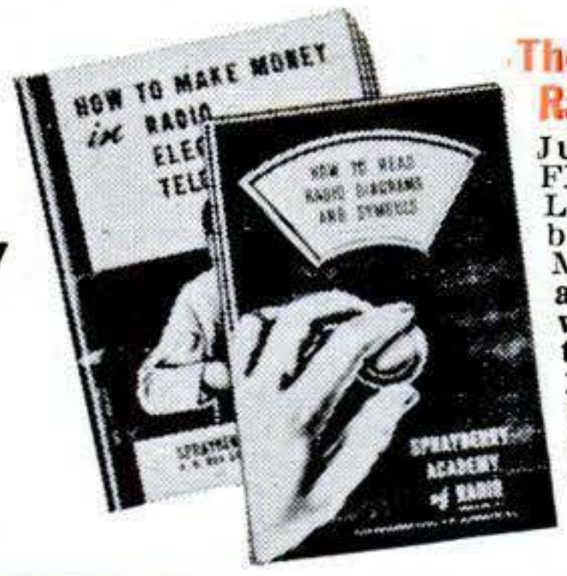

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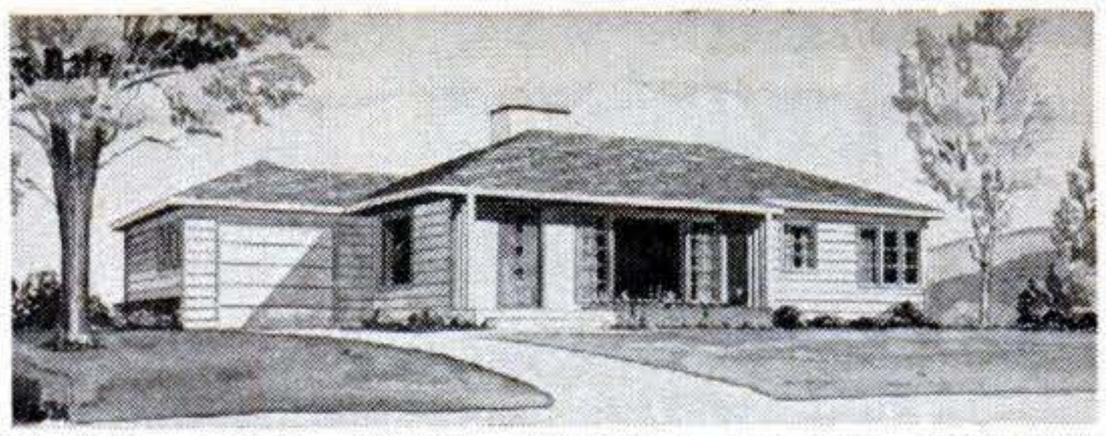

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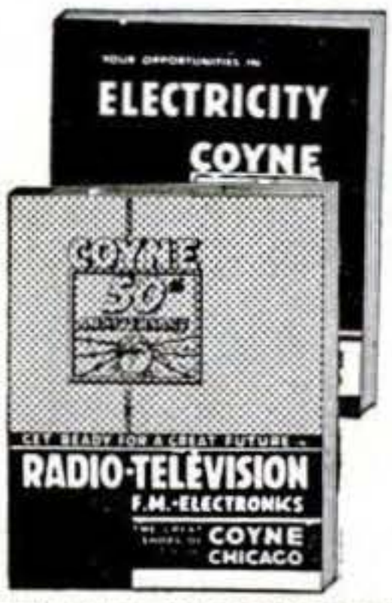

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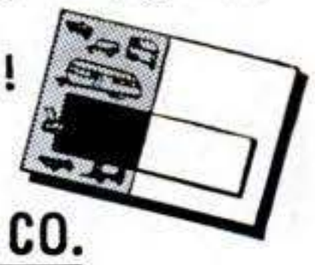

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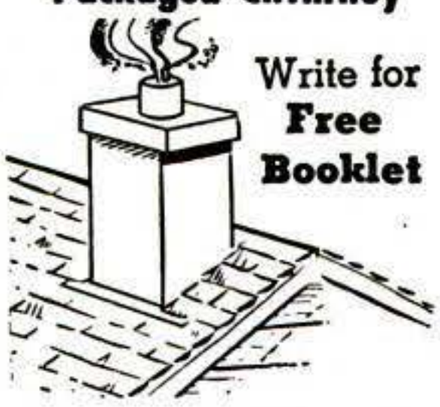

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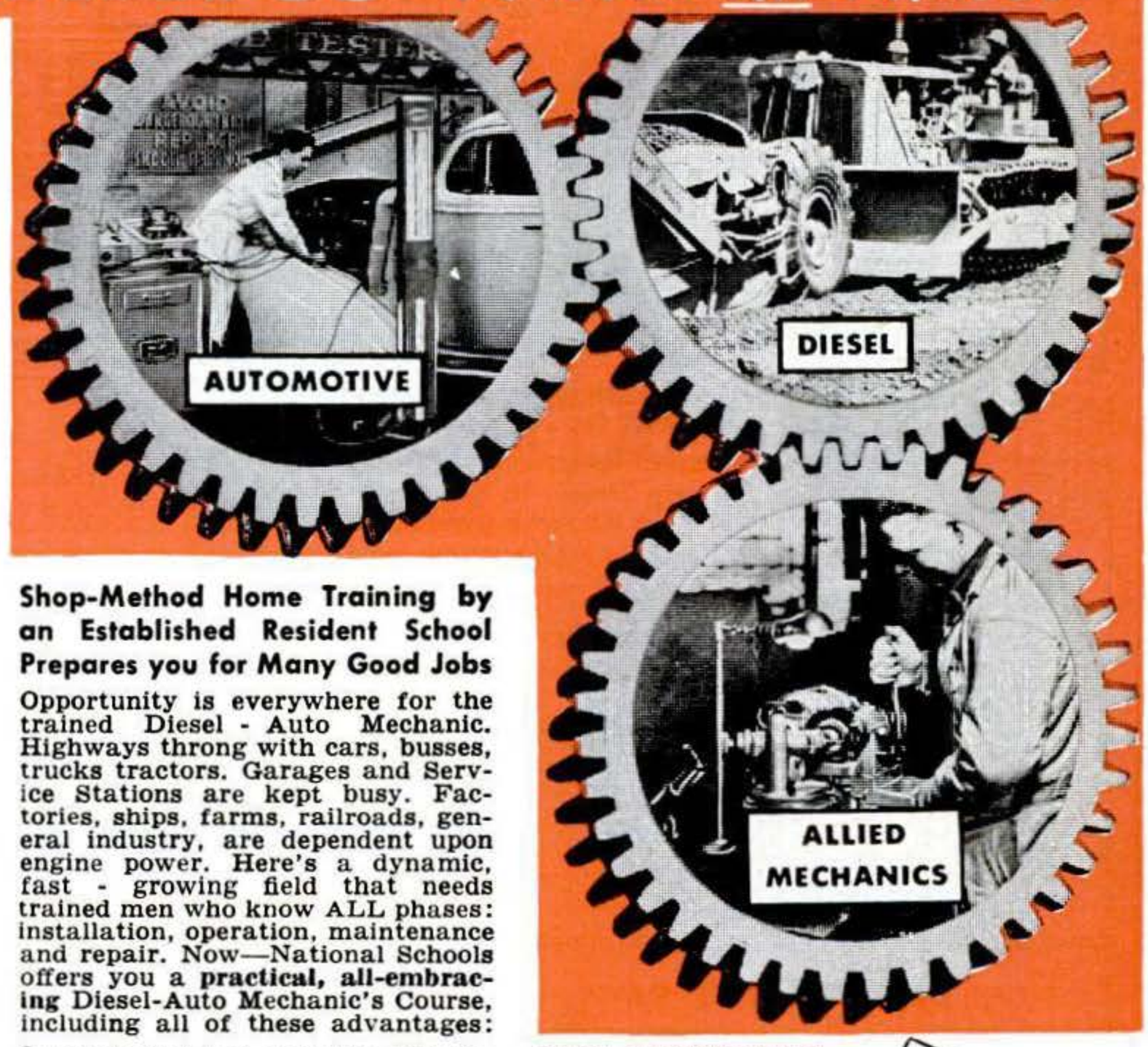

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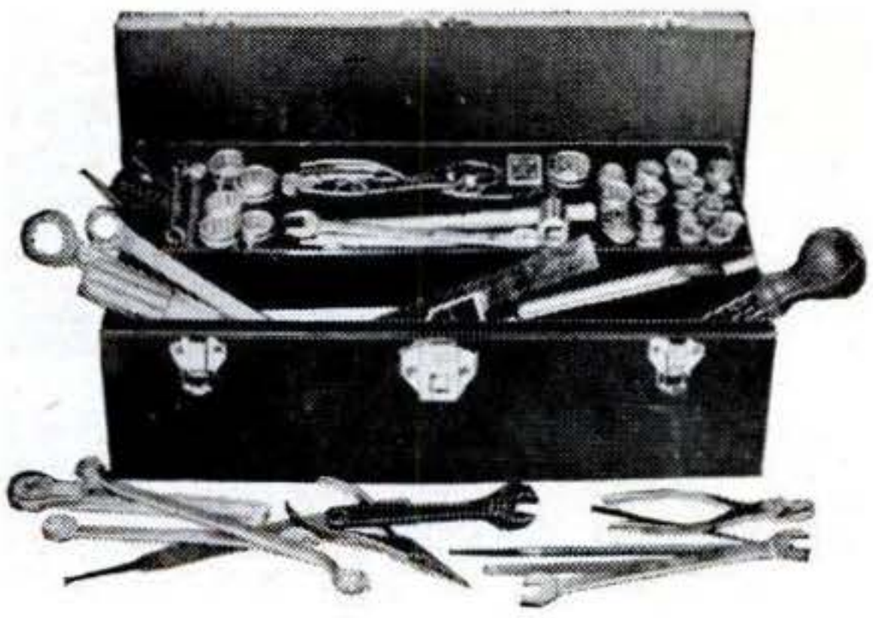

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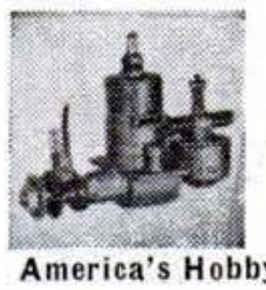

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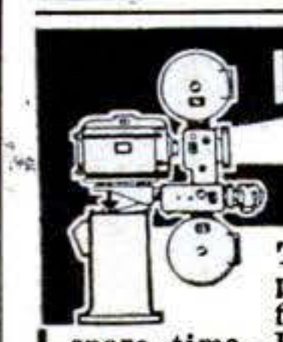

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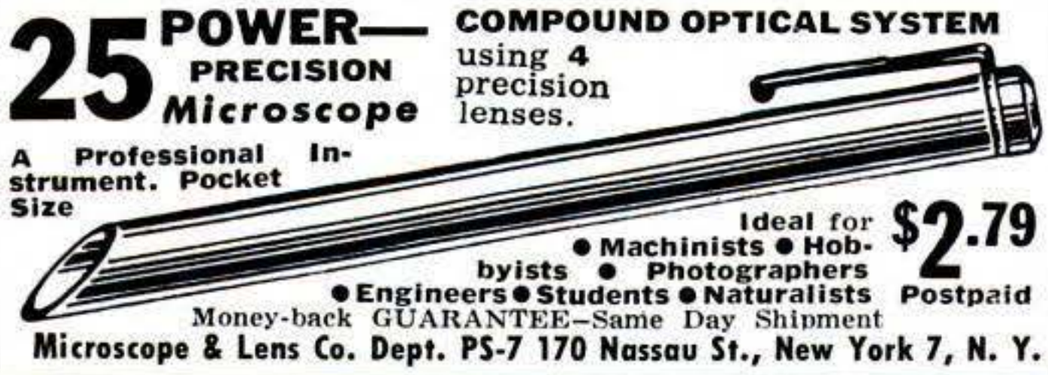

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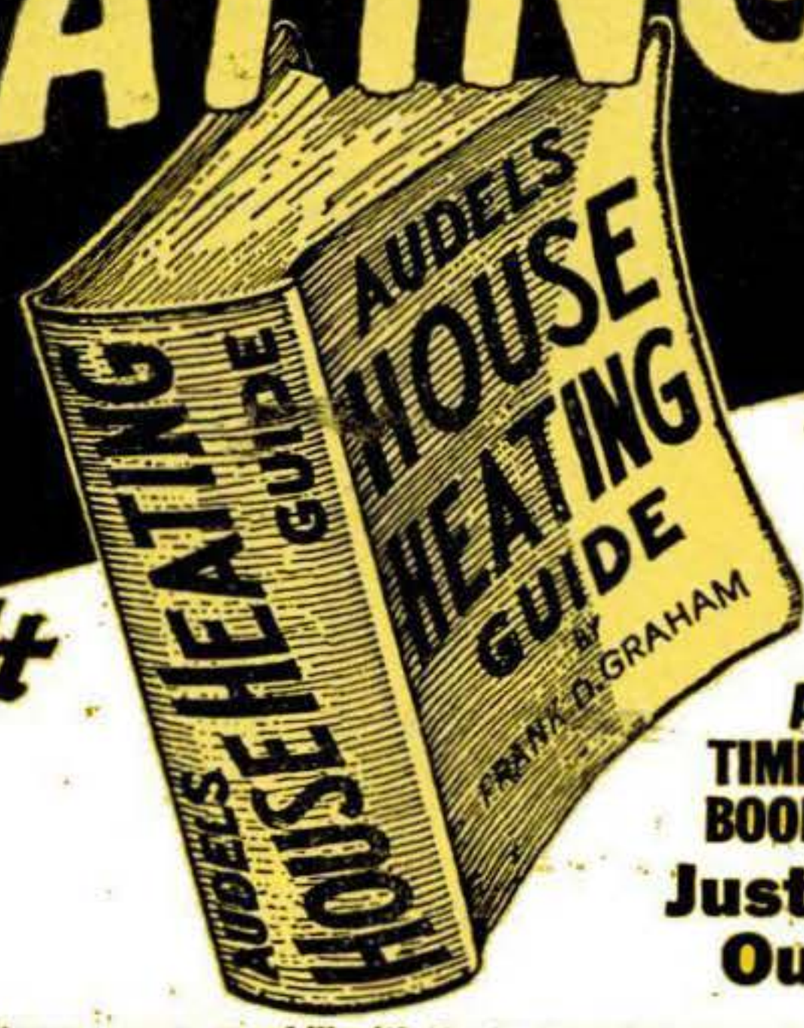

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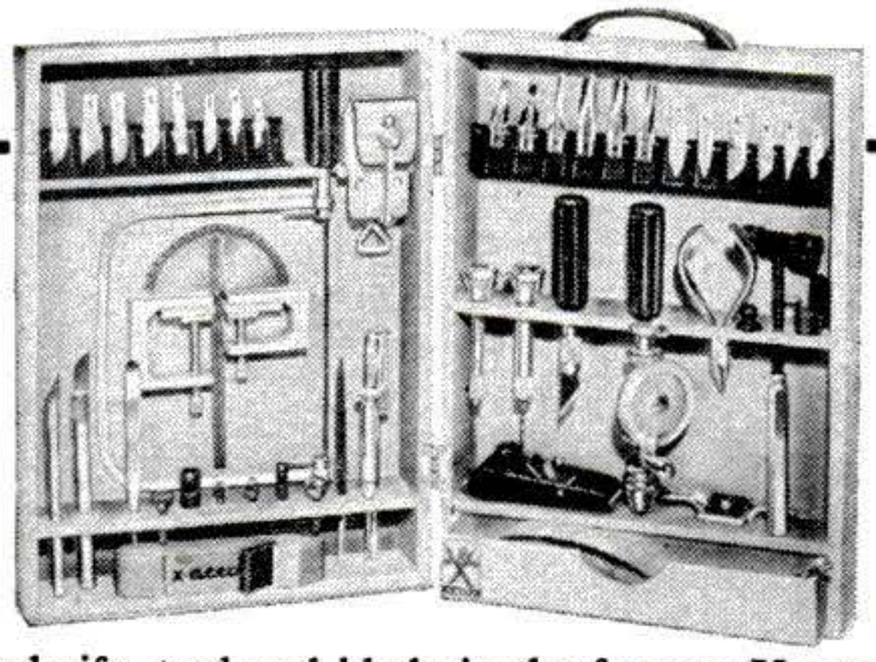

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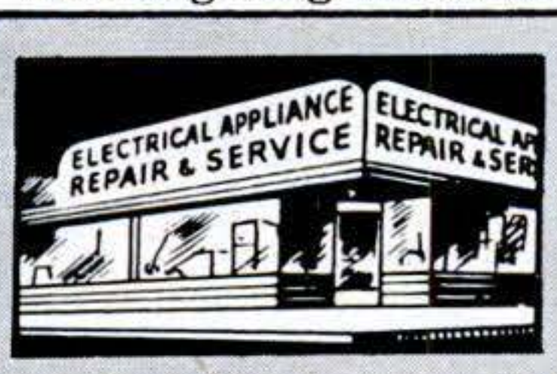

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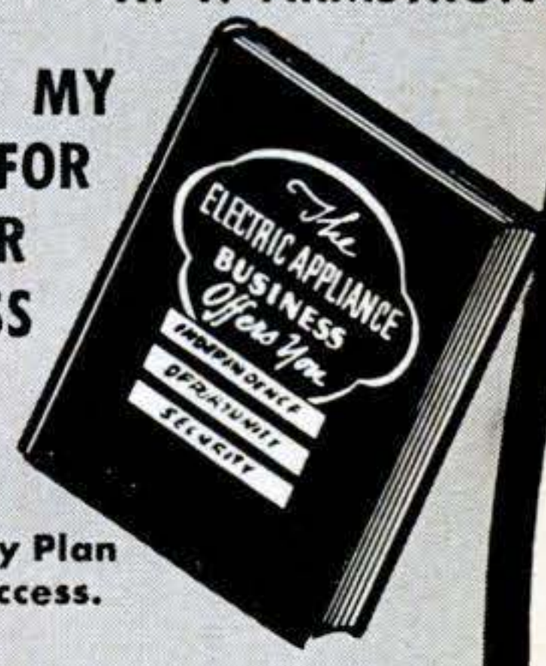

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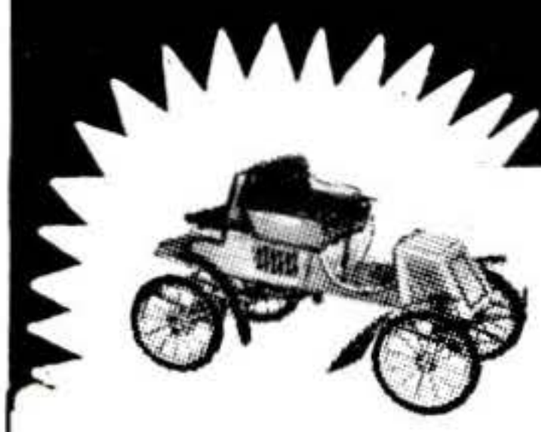

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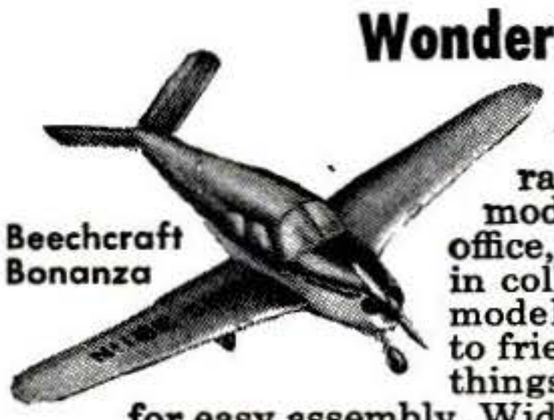

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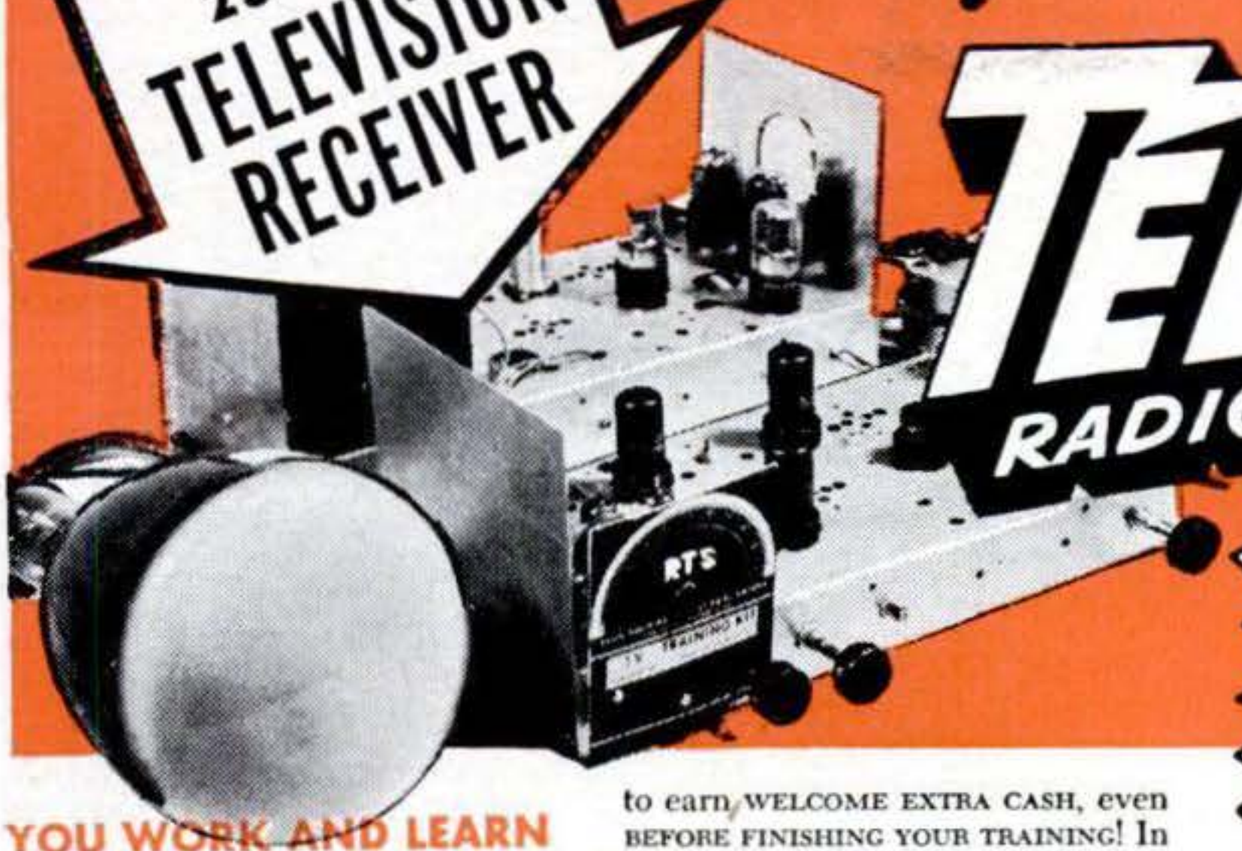

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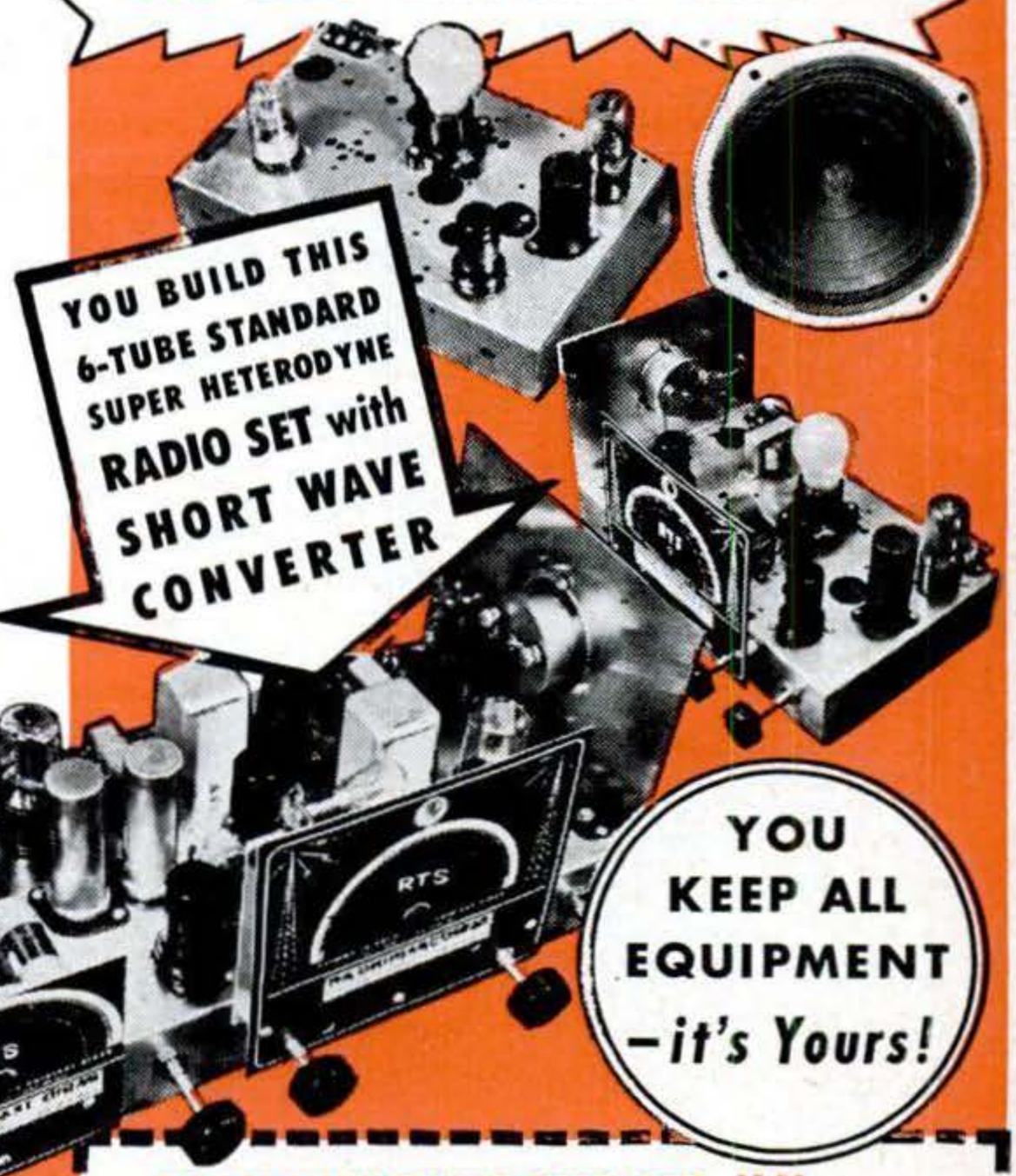

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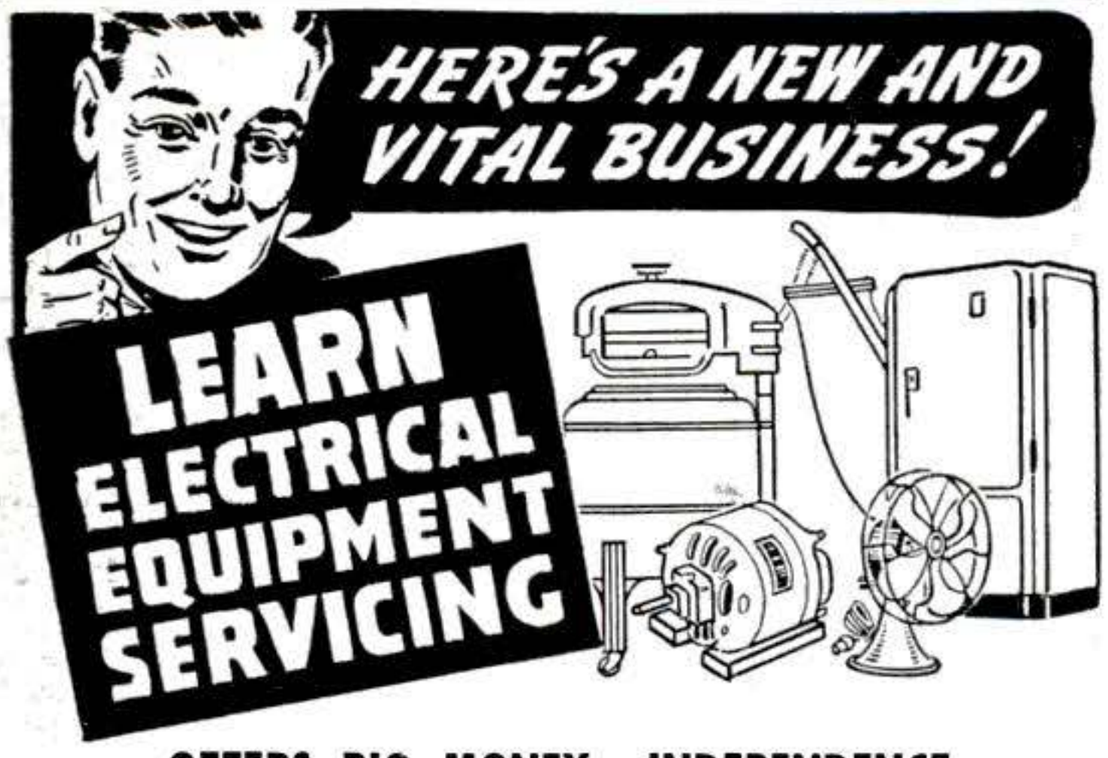

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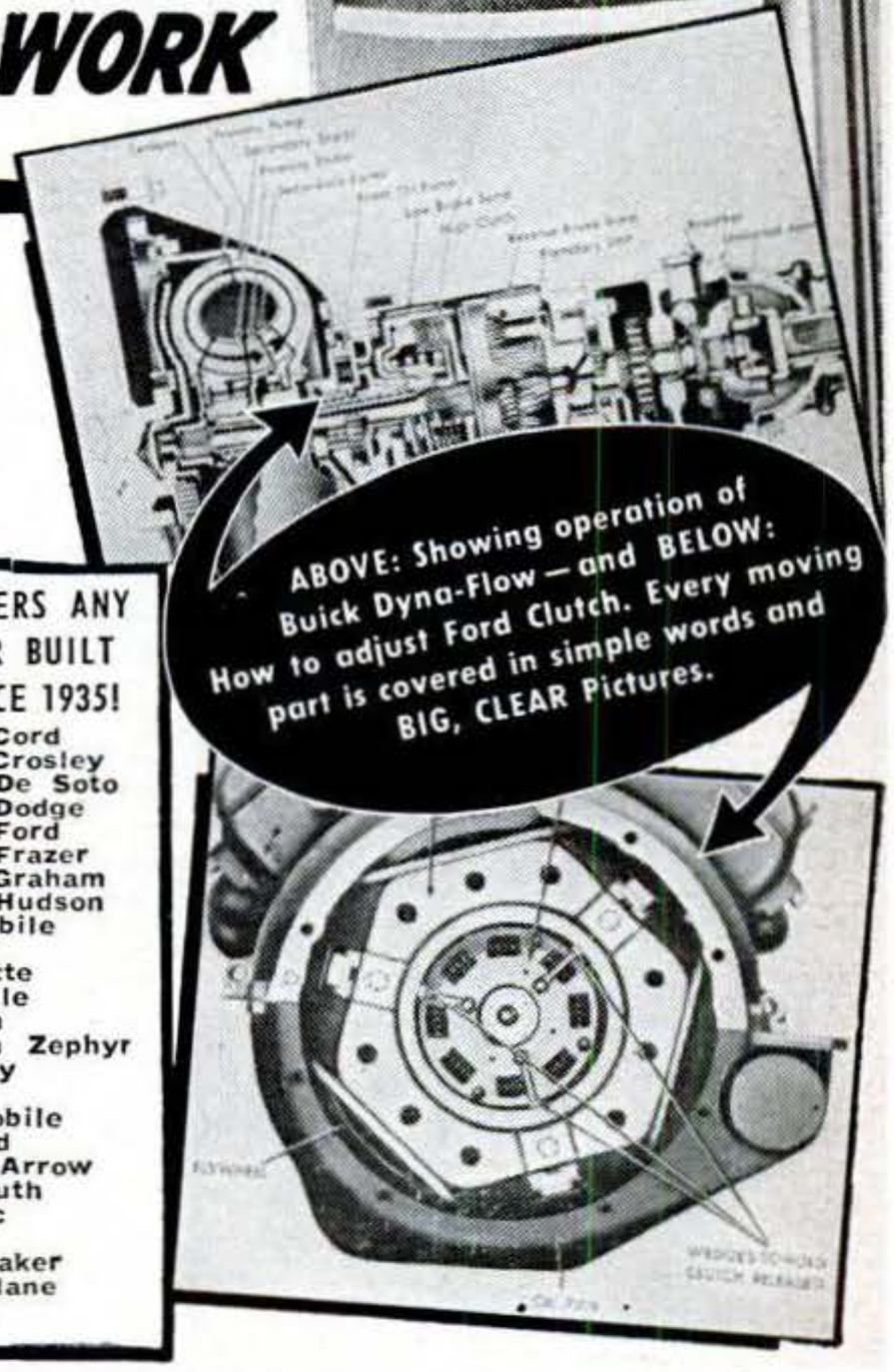

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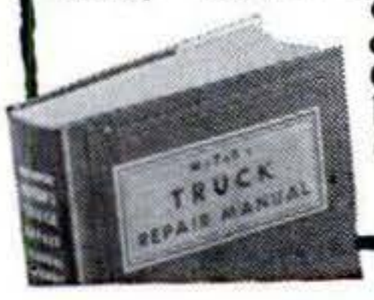

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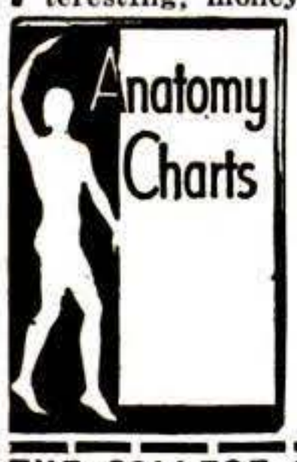

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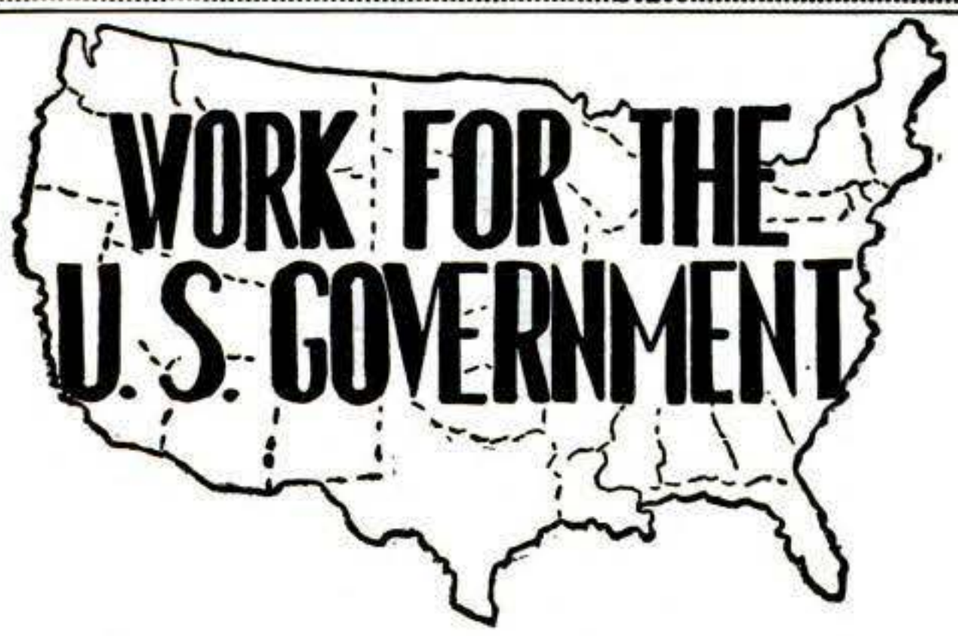

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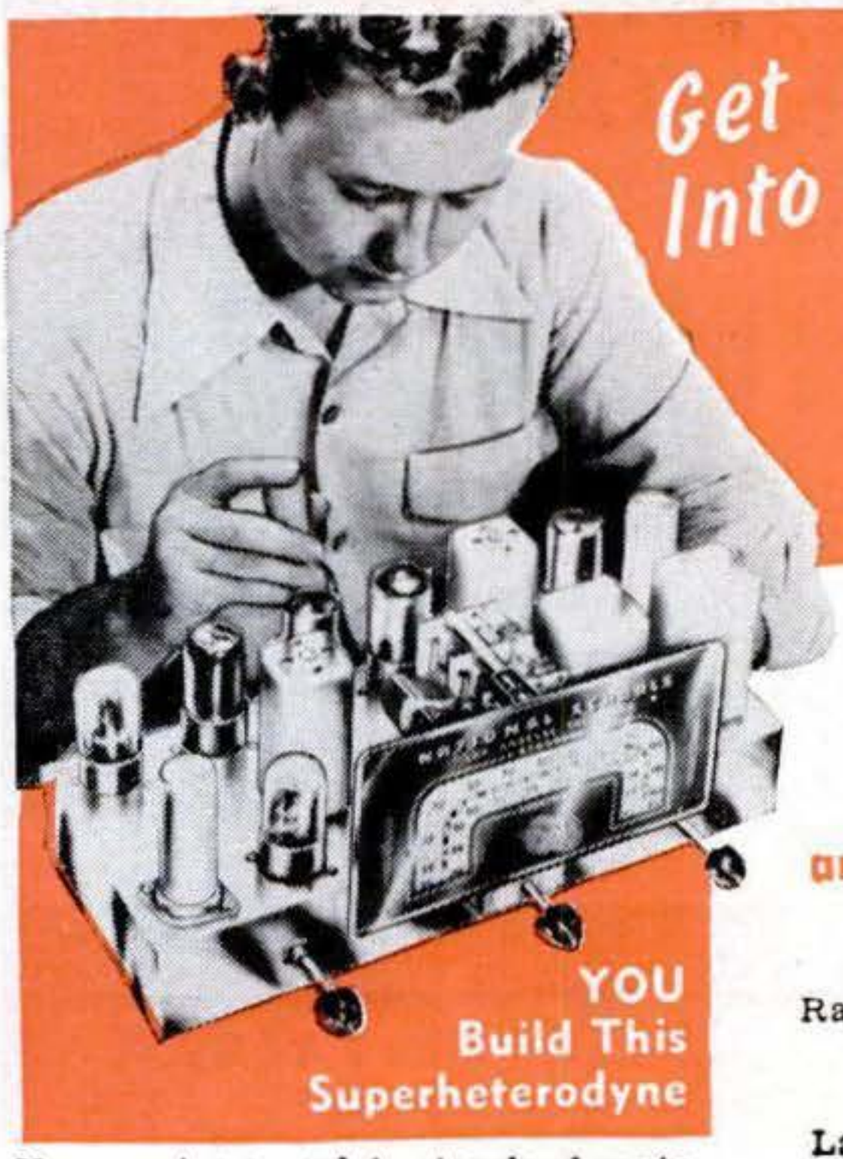

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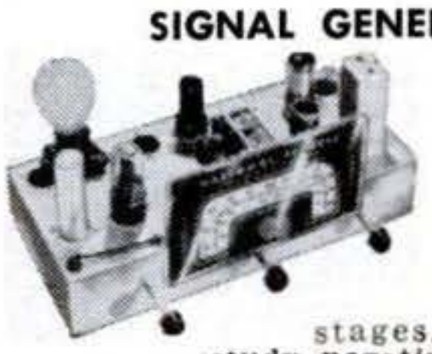

You construct the Transitron Signal Generator shown here, demonstrating Transitron principles in both R.F. and A.F. stages. You study negative type oscillators at firsthand.

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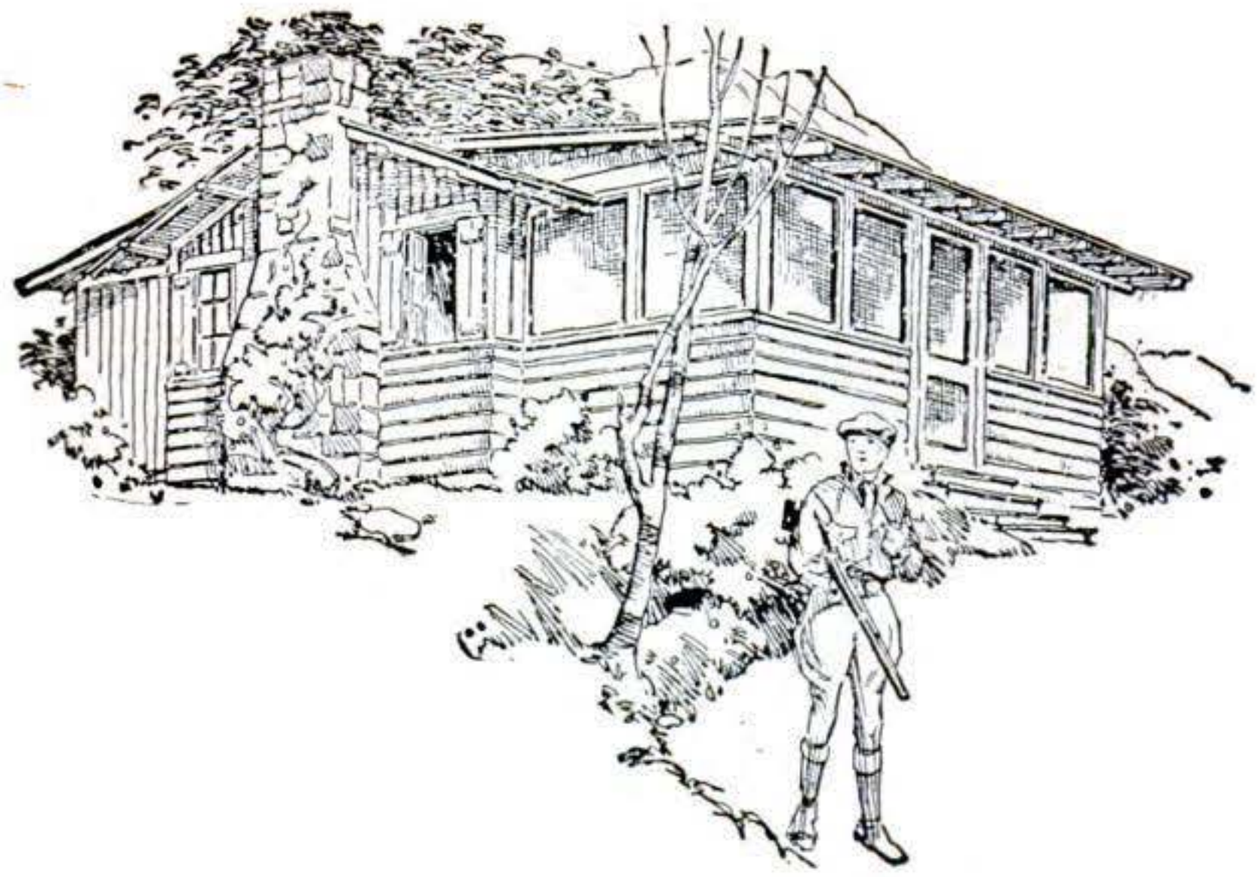

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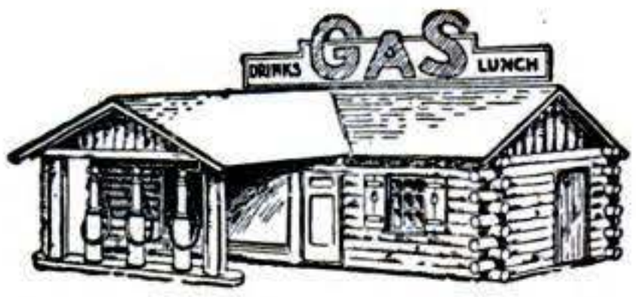

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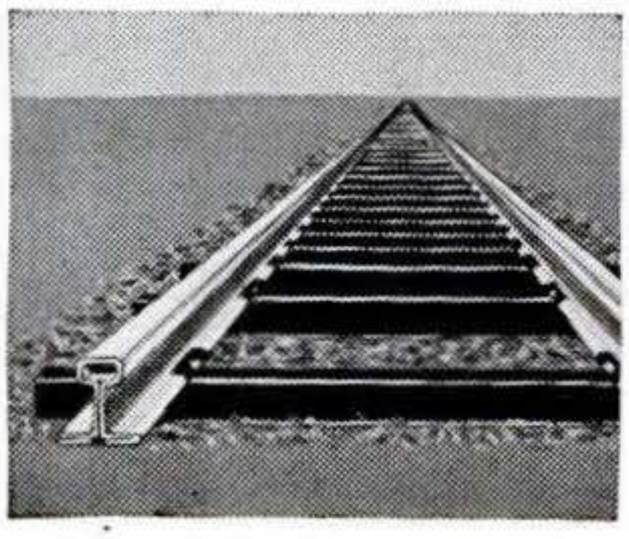

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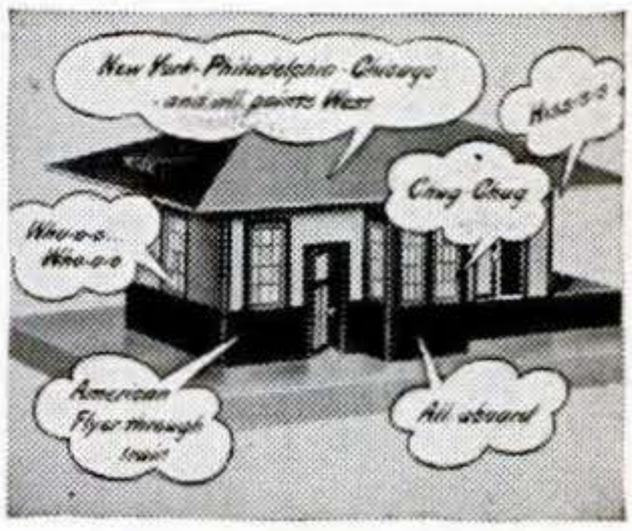

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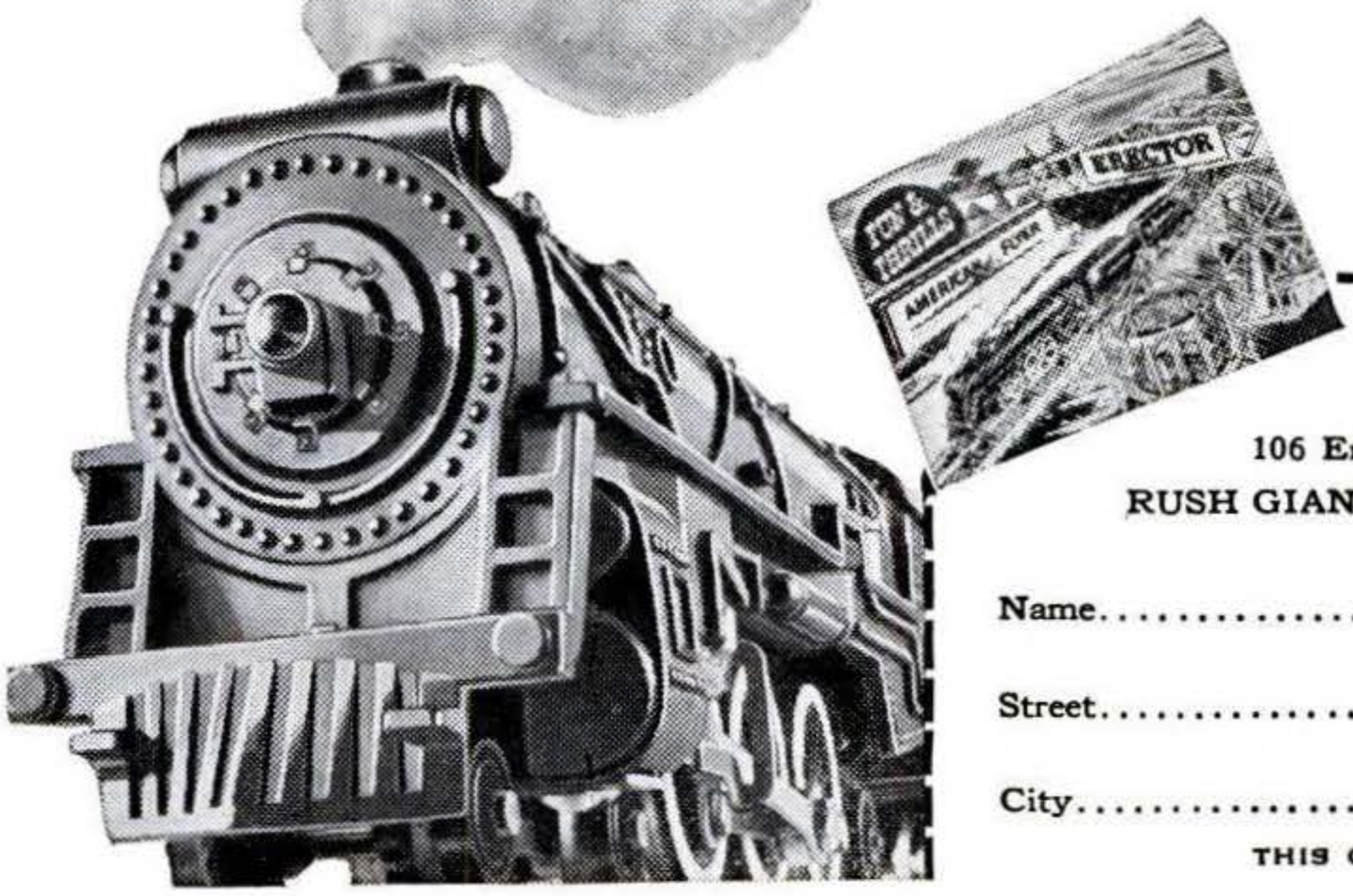

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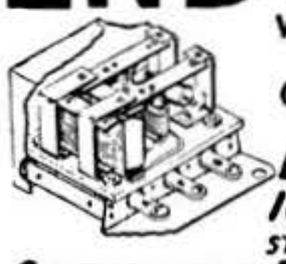

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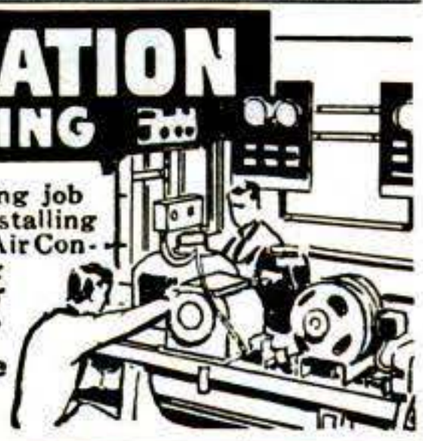

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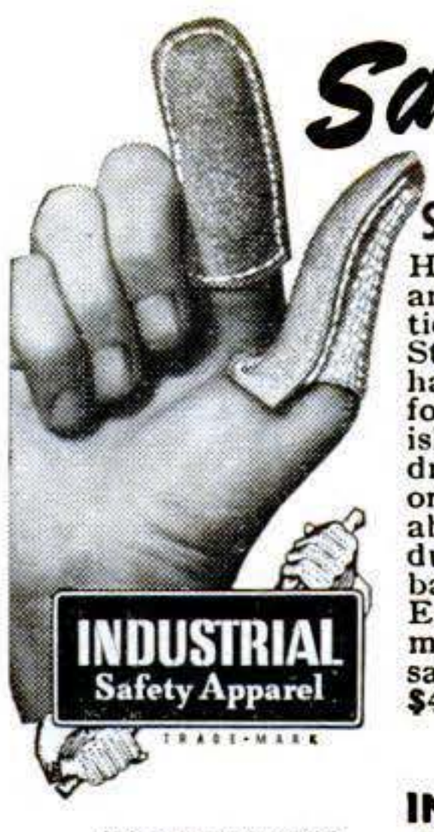

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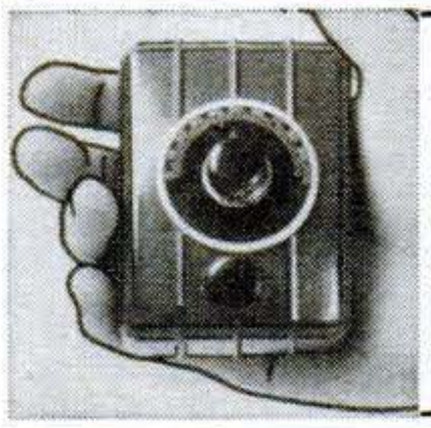

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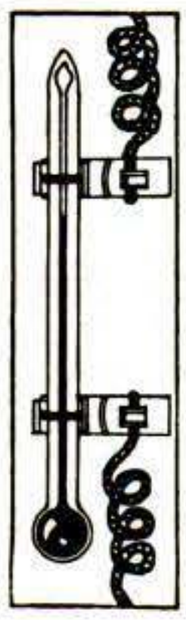

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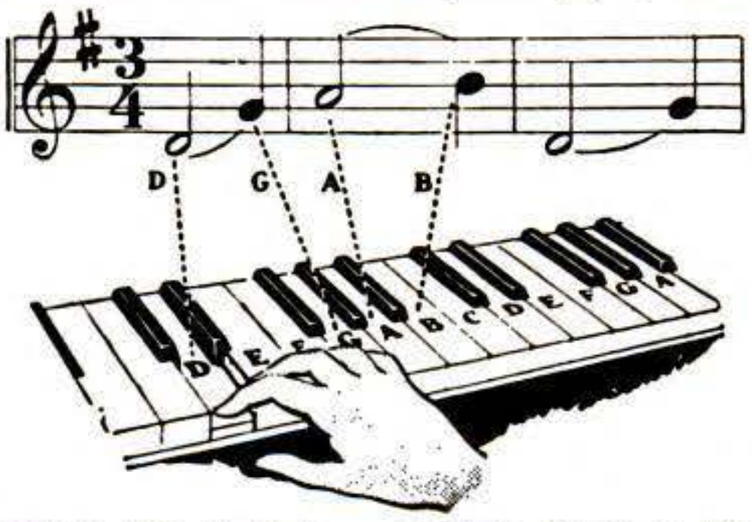

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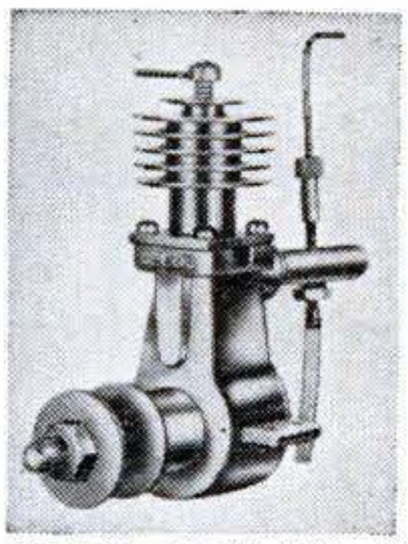

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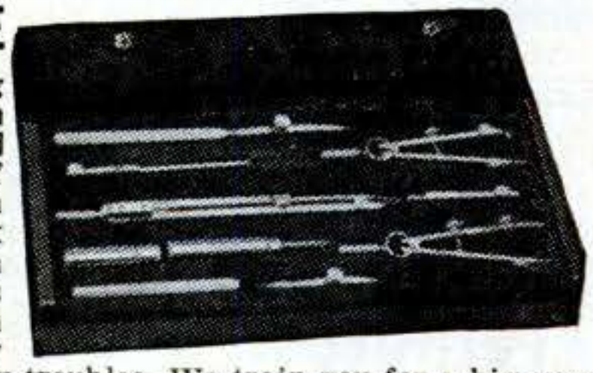

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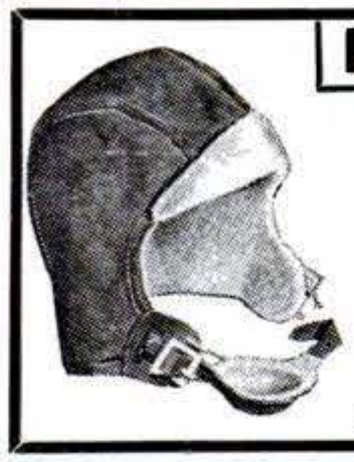

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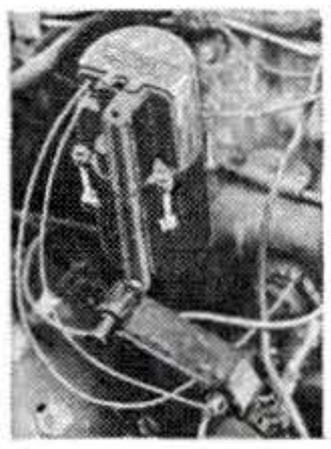

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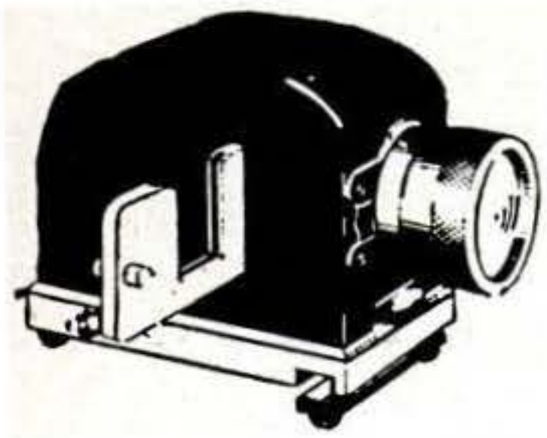

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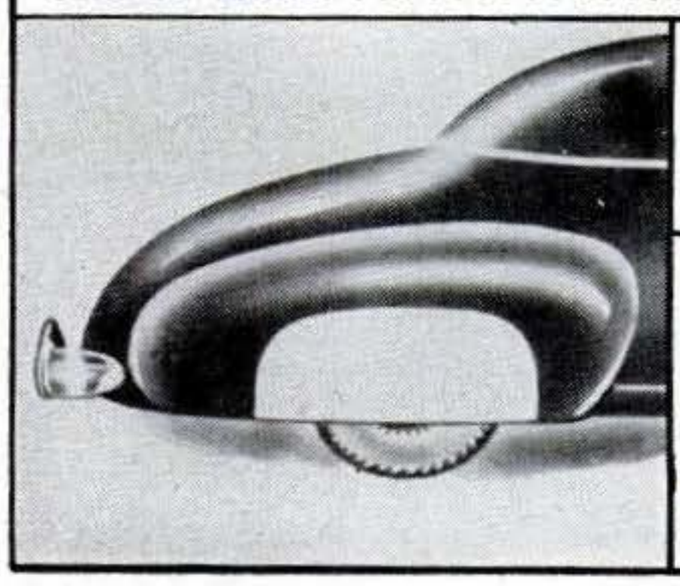

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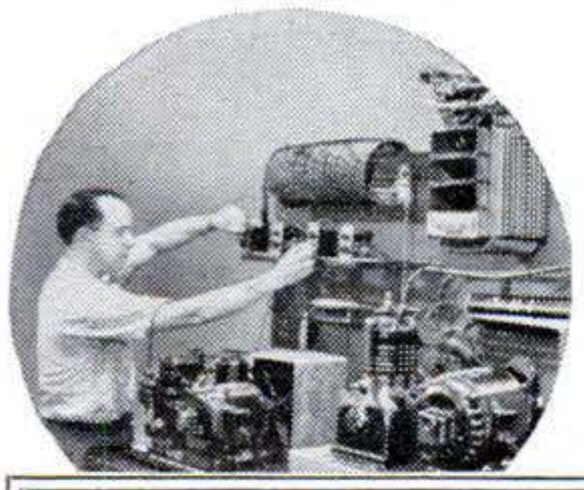

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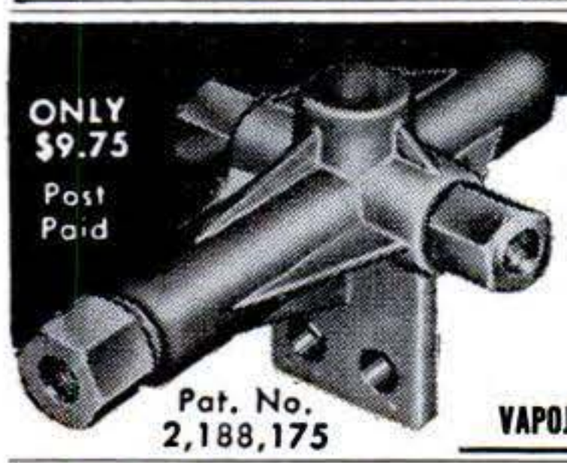

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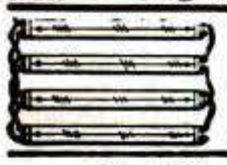

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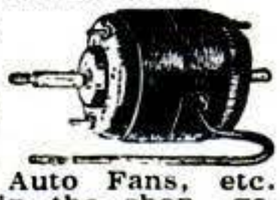

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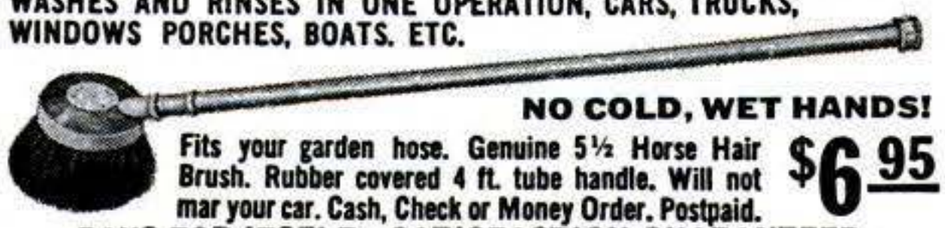

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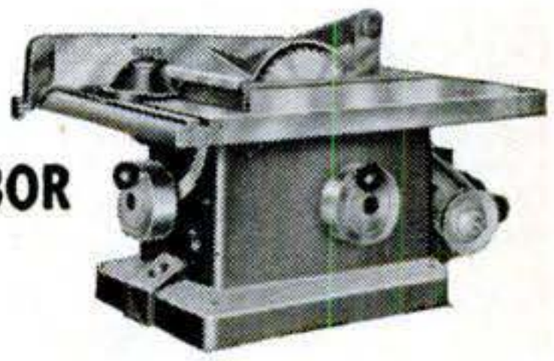

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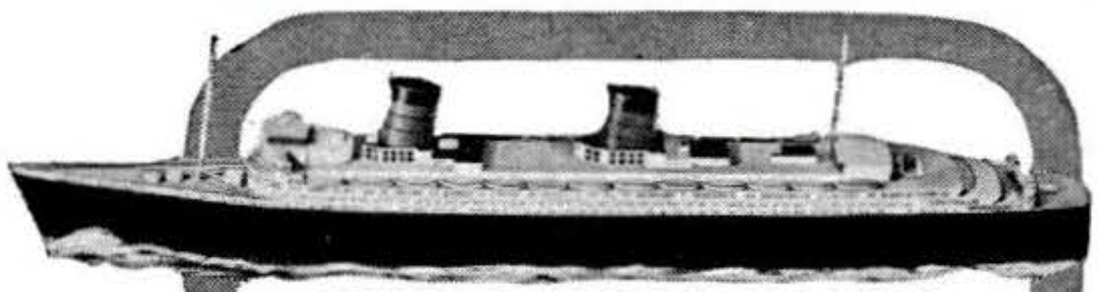

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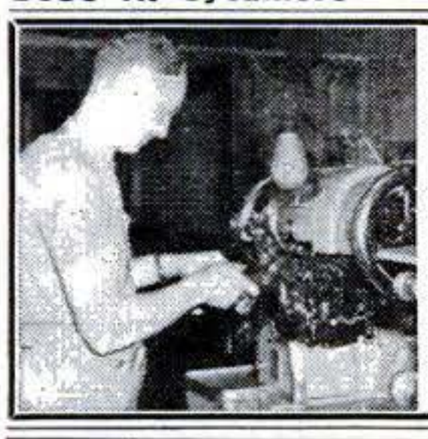

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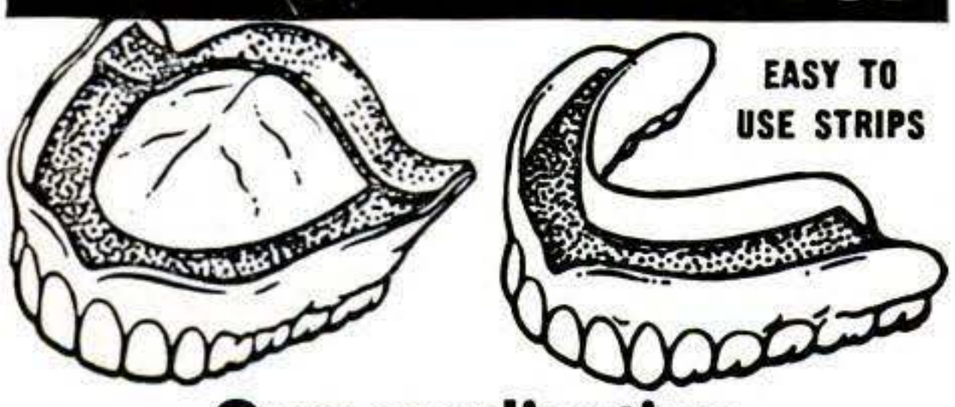

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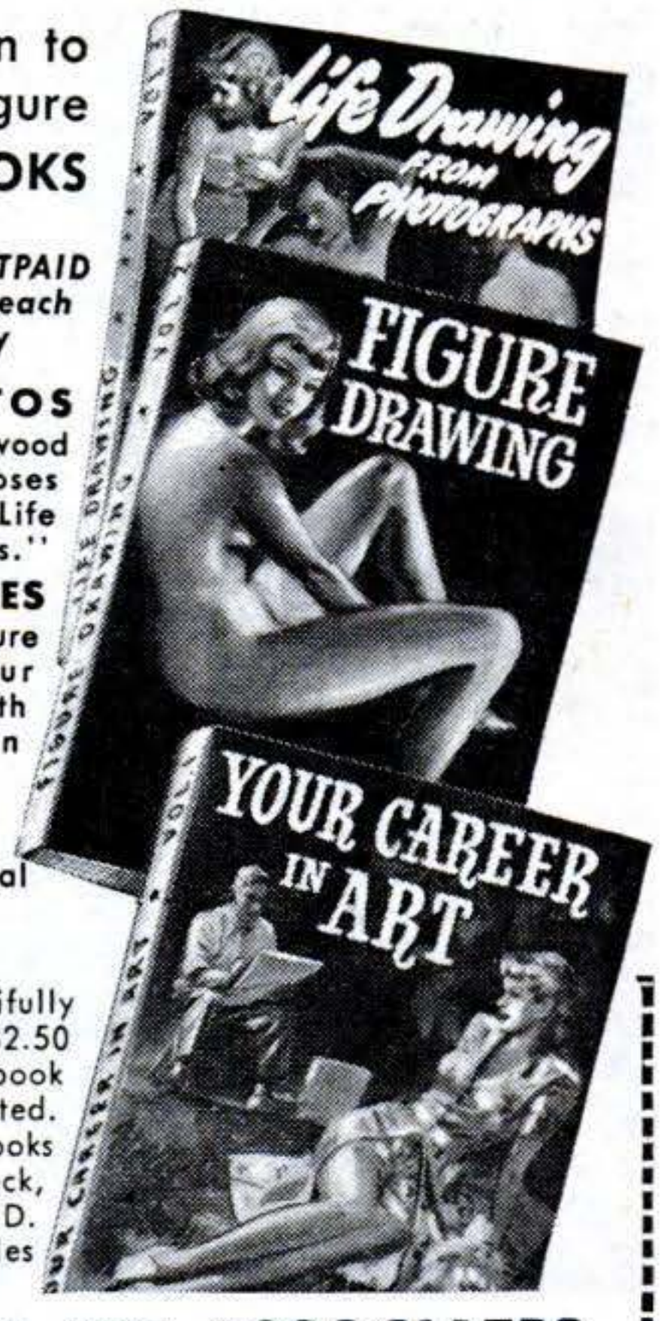

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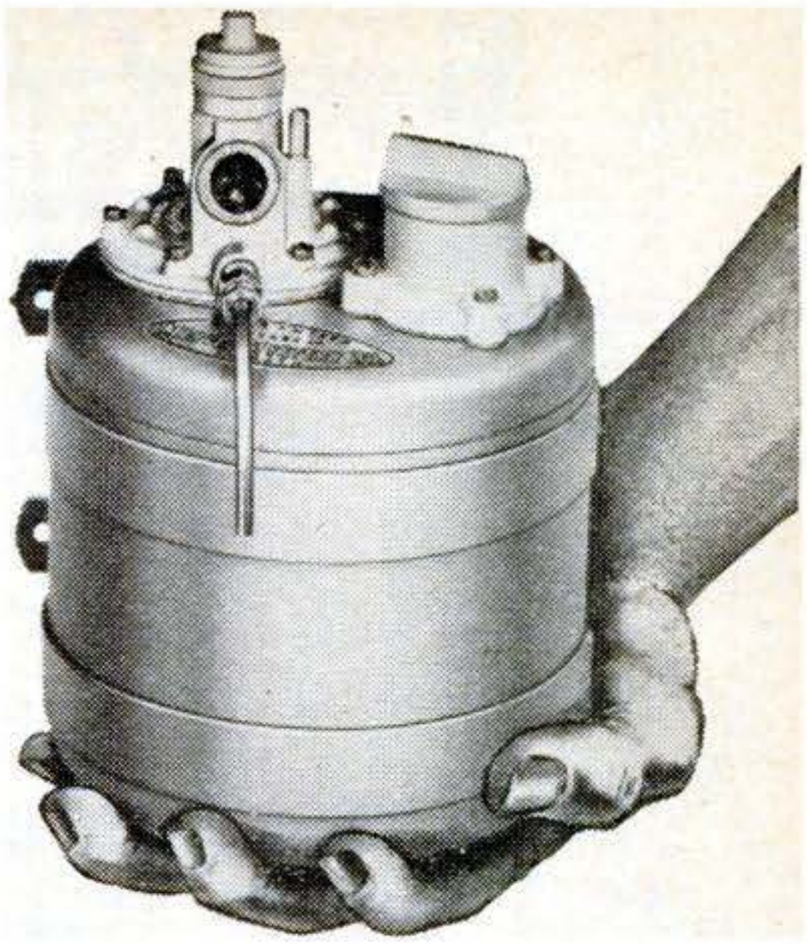

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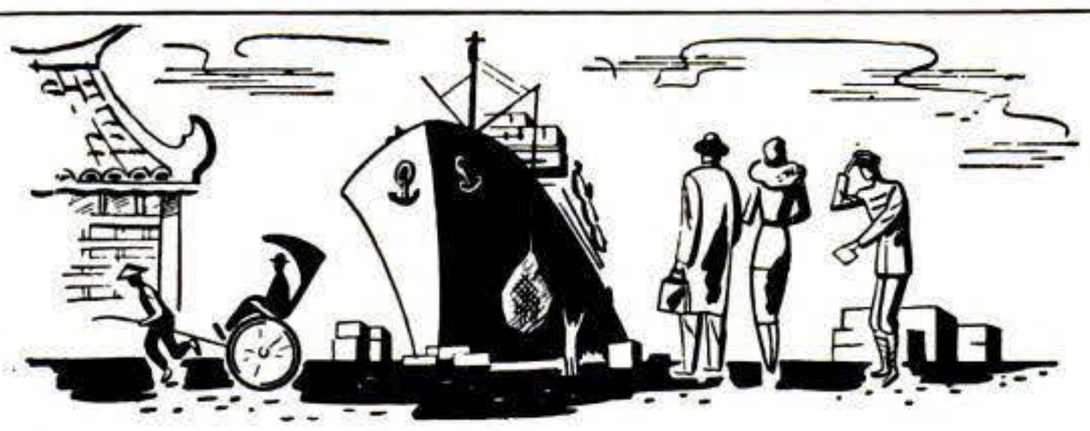

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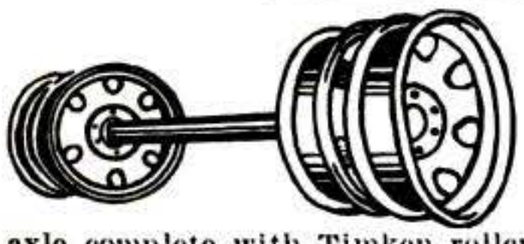

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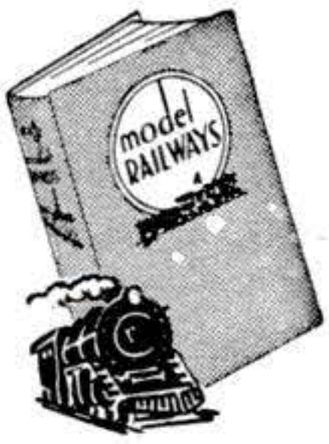

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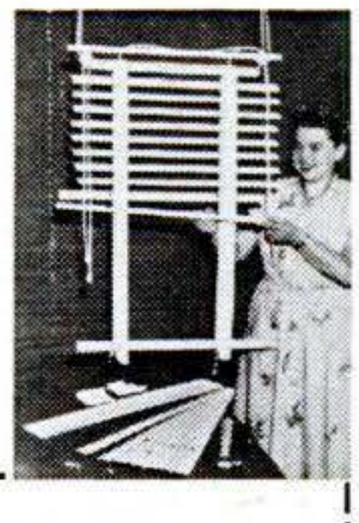

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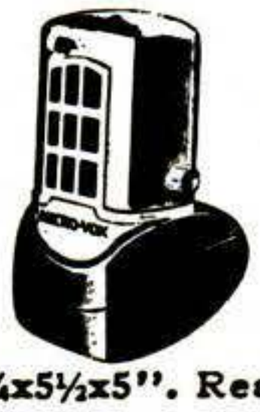

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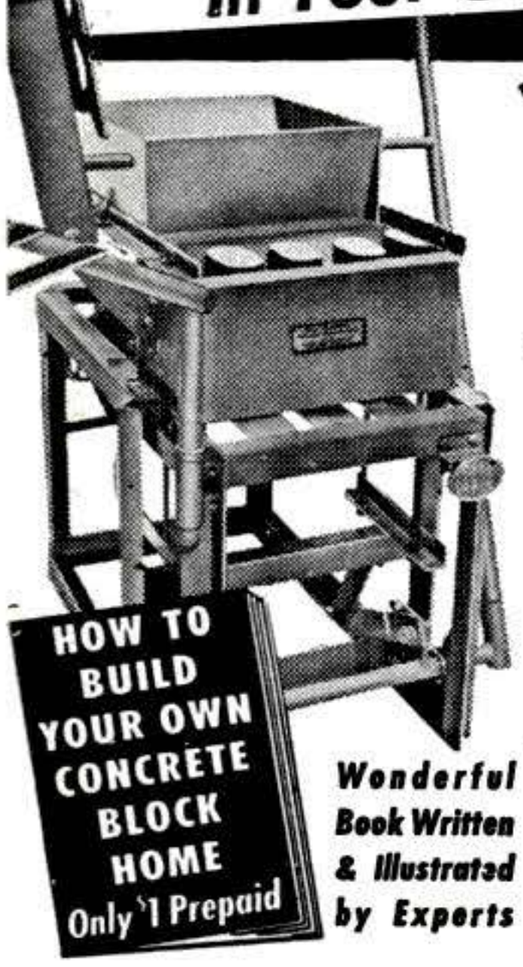

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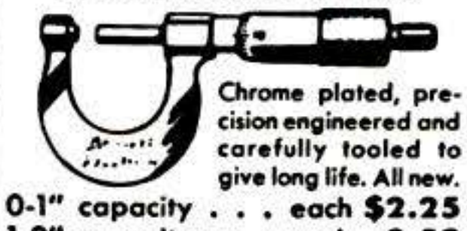

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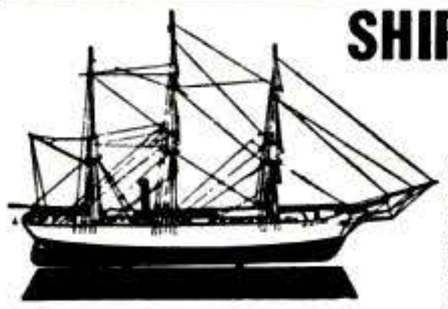

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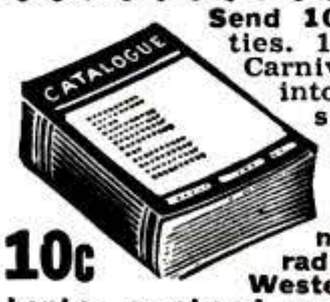

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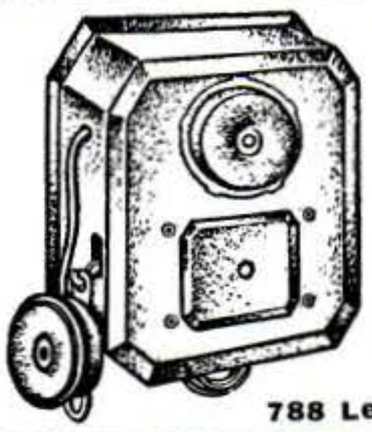

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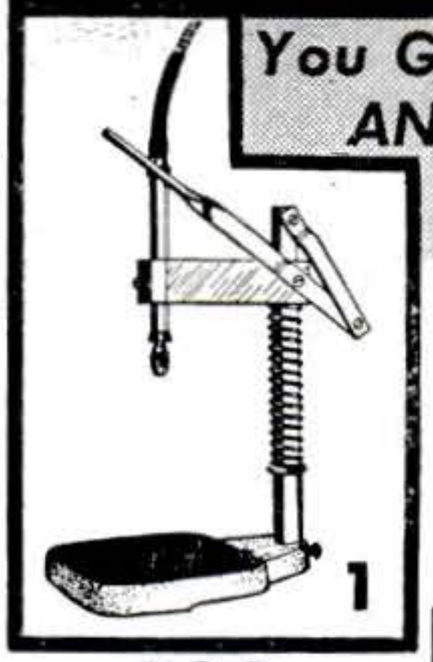

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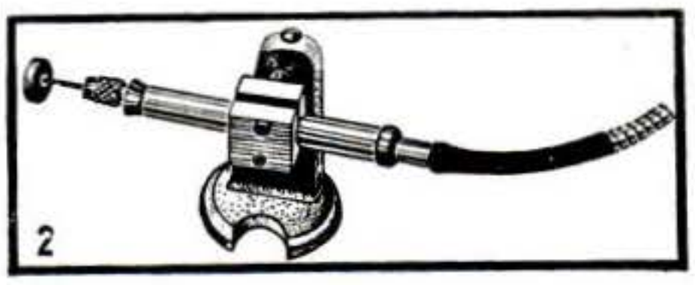

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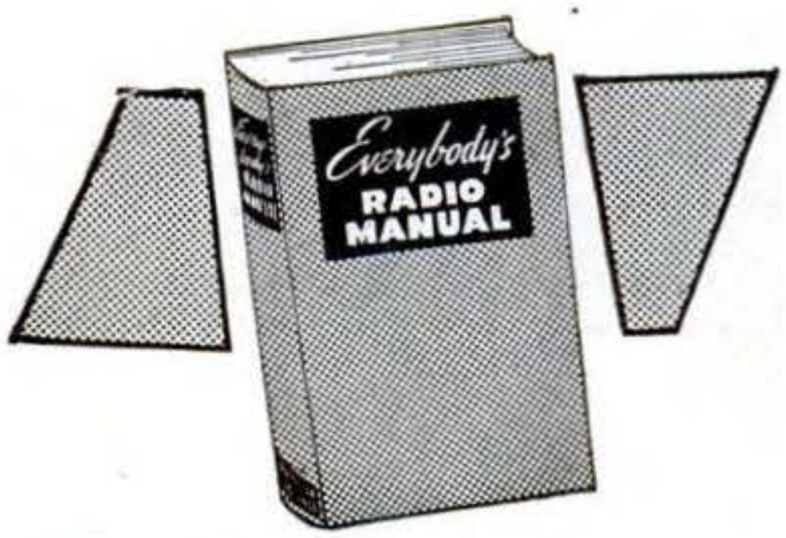

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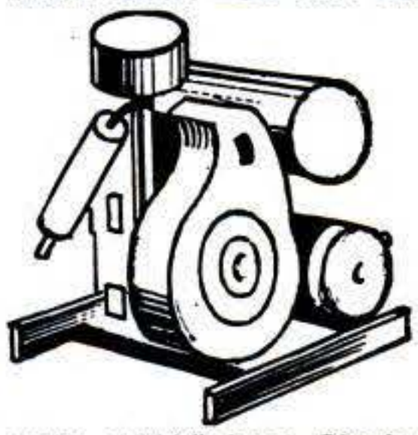

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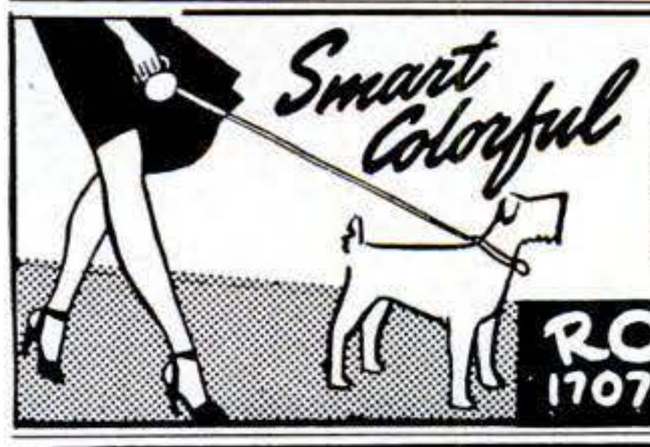

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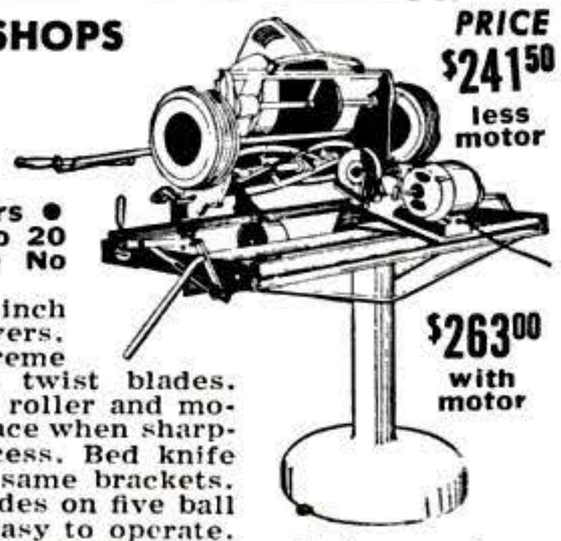

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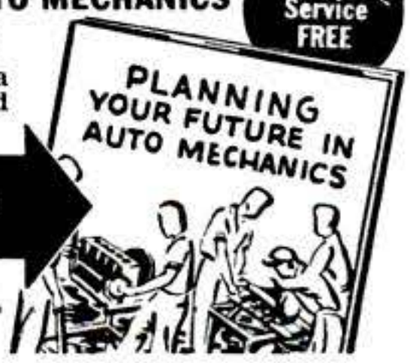

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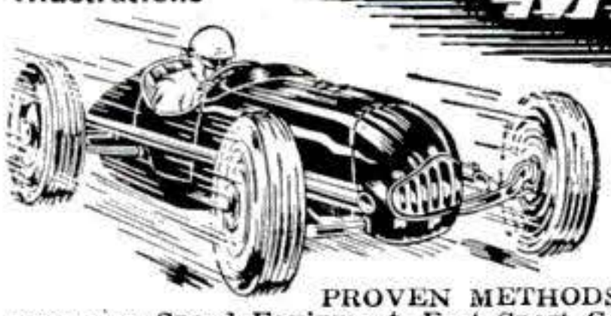

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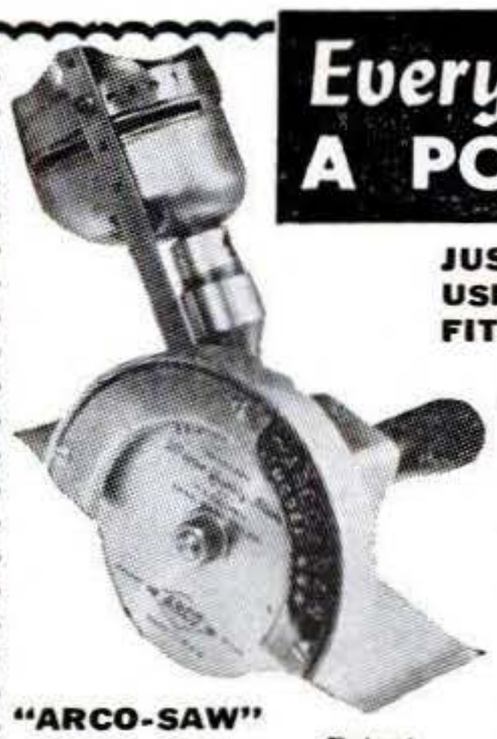

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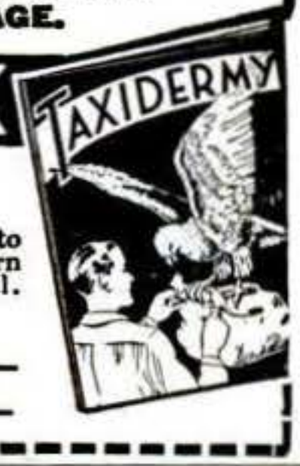

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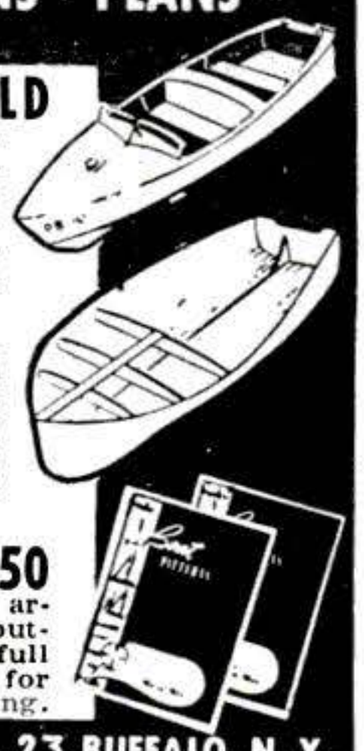

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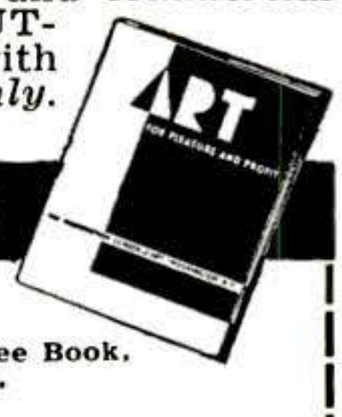

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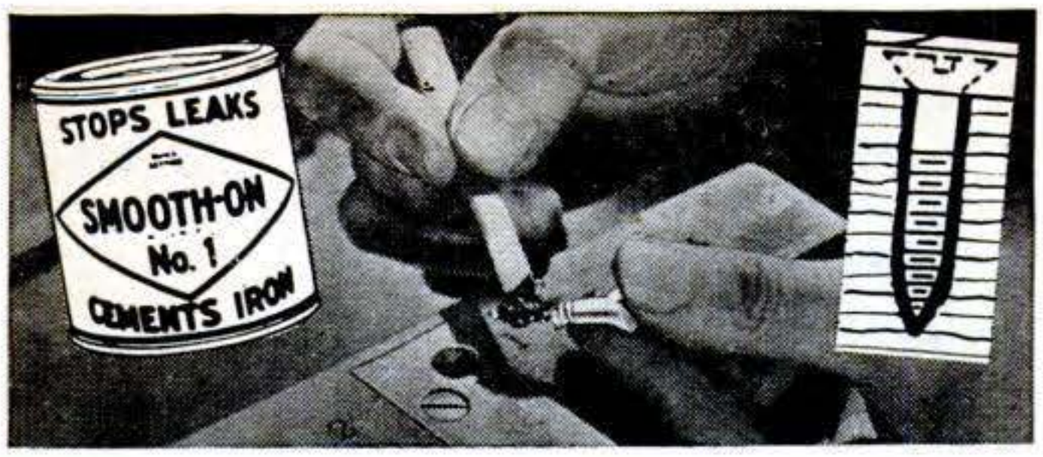

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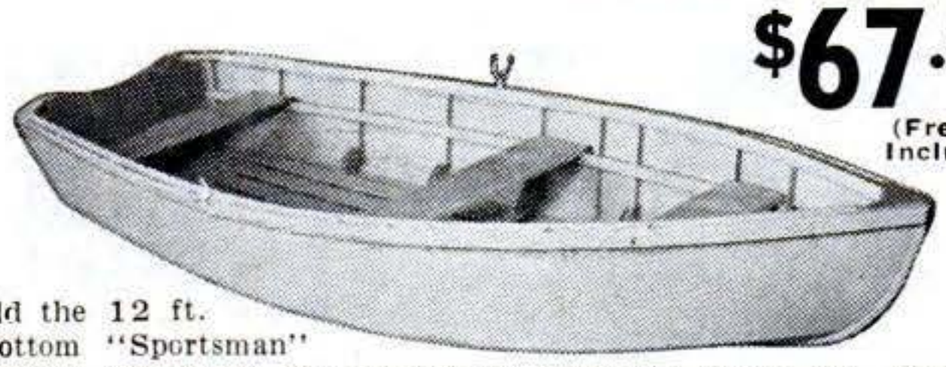

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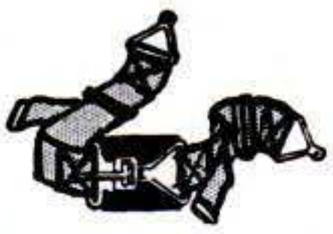

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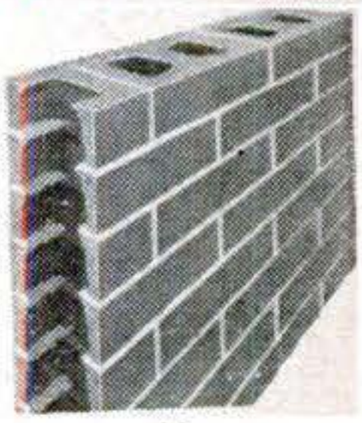

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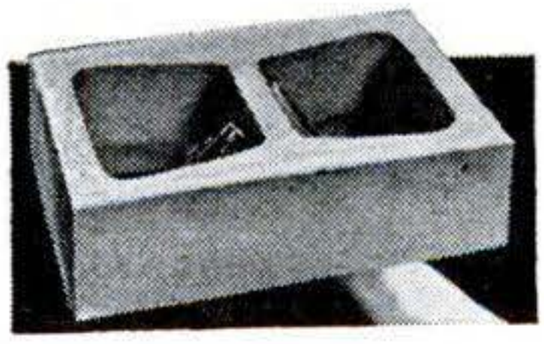

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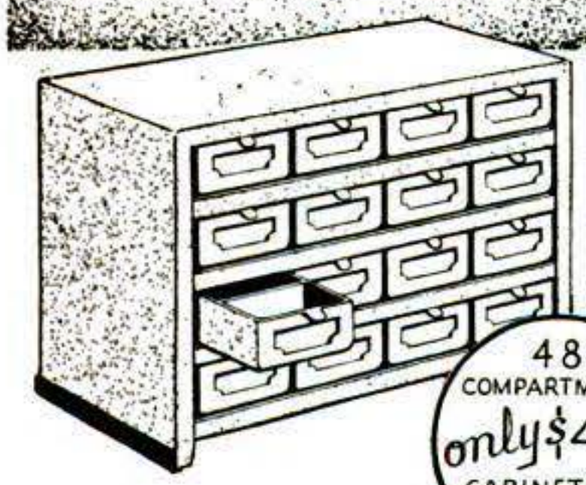

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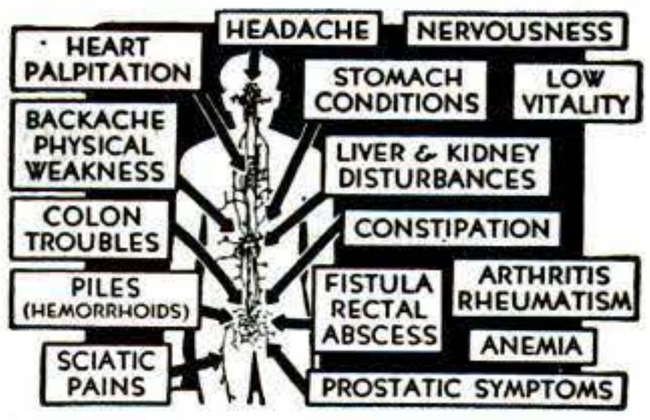

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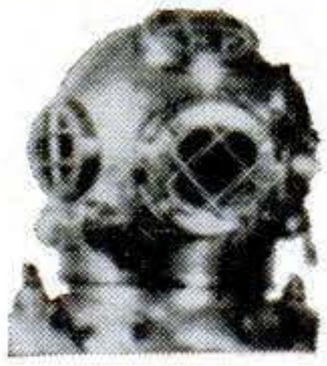

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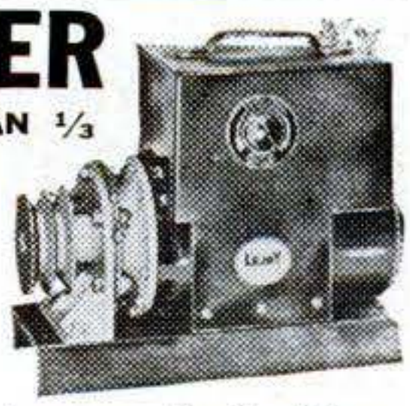

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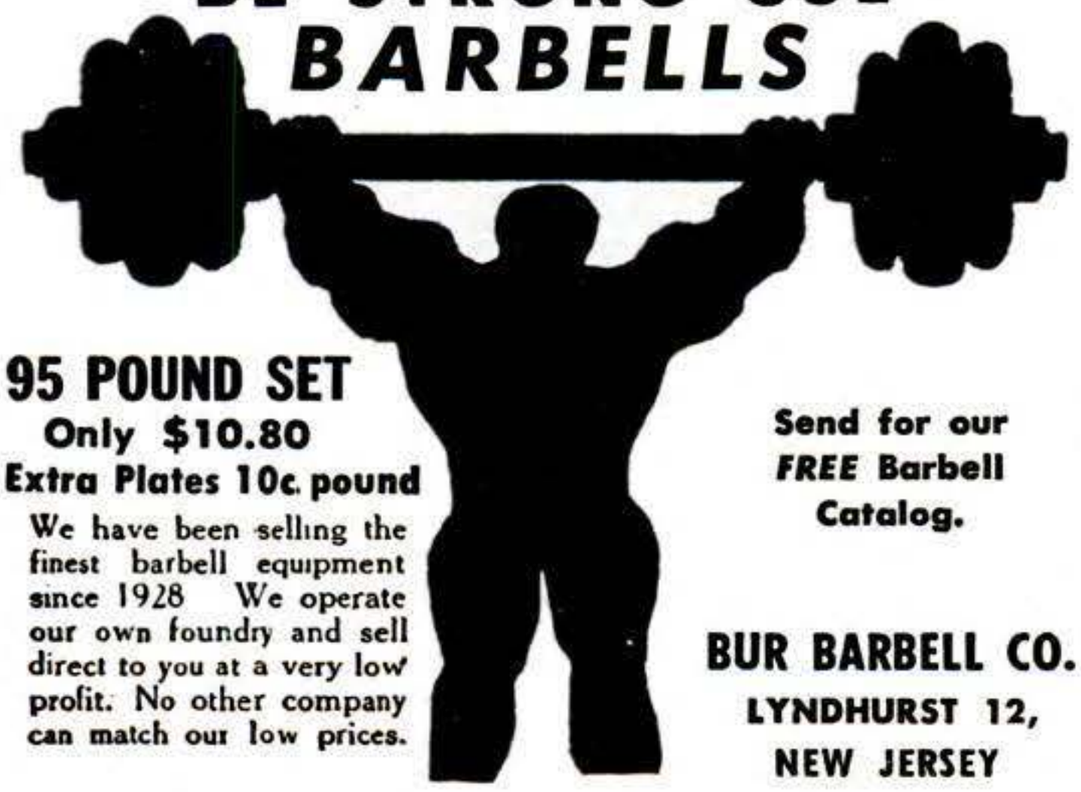

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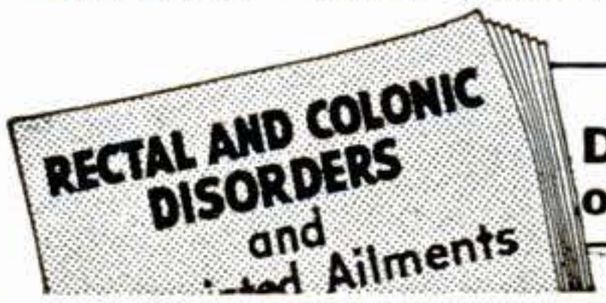

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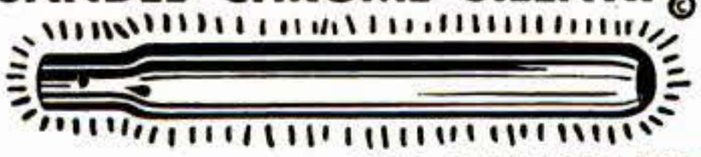

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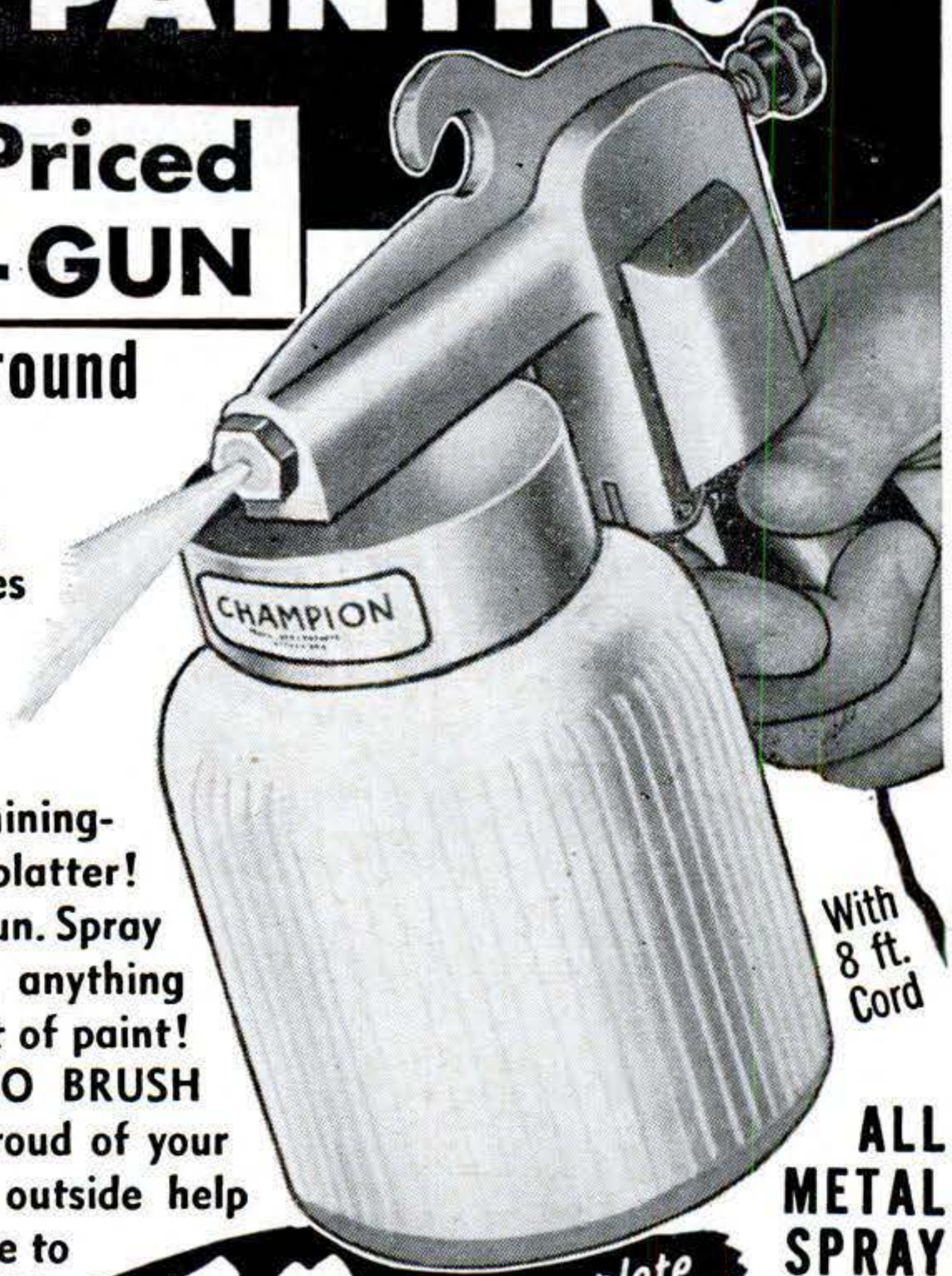

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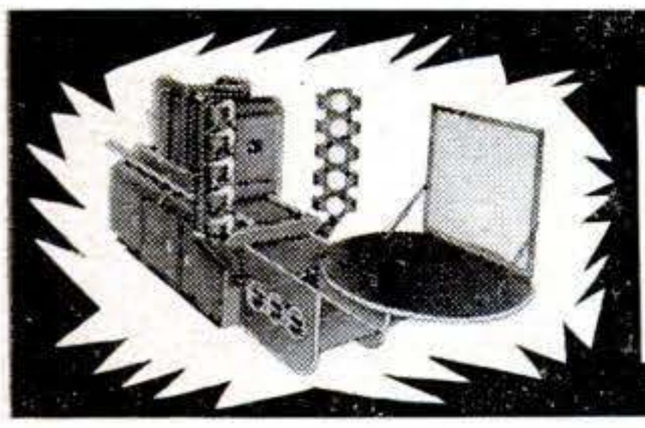

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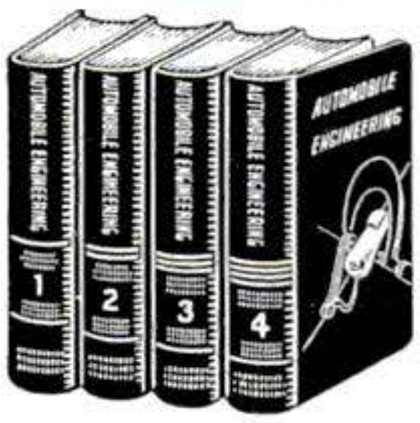

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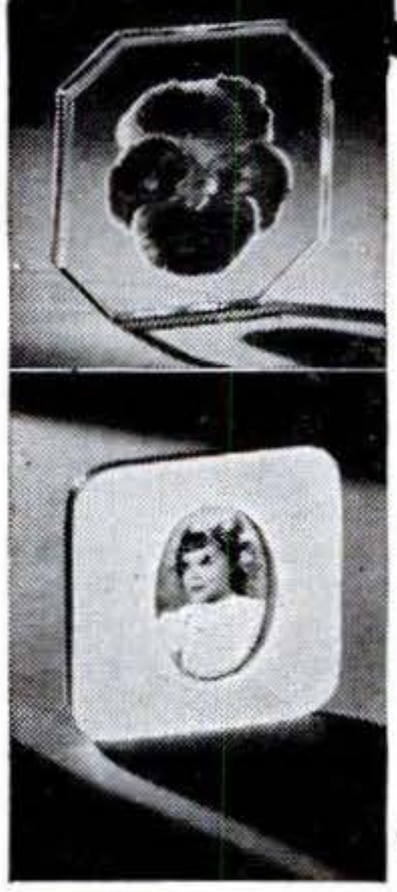

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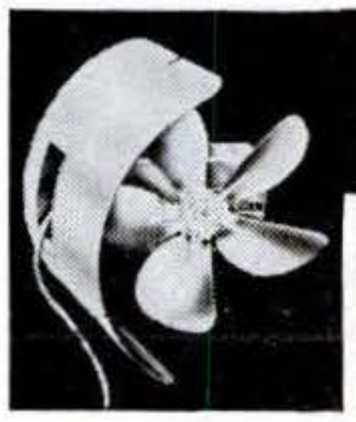

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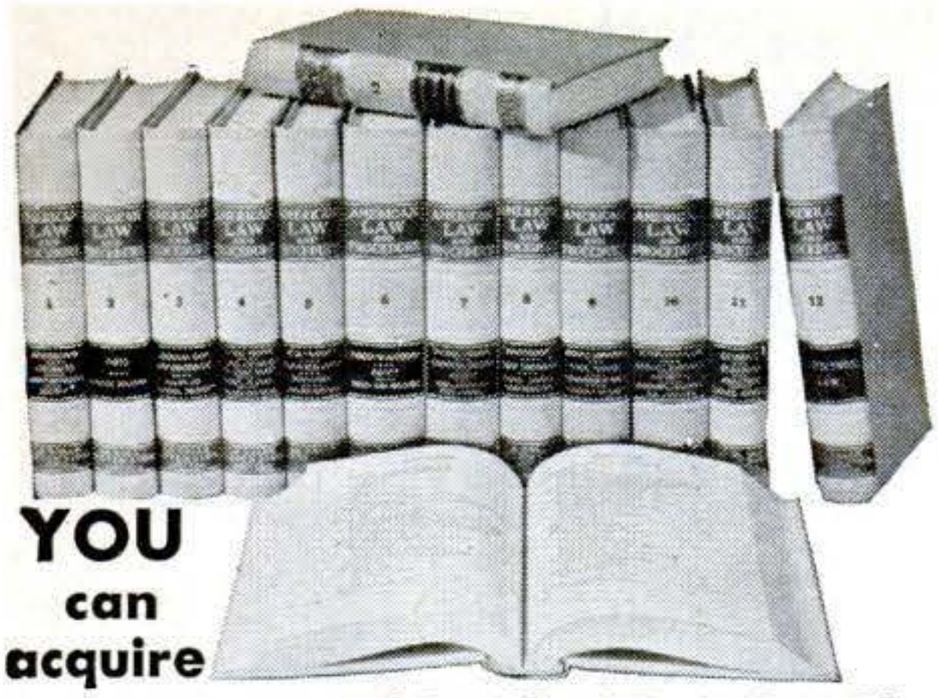

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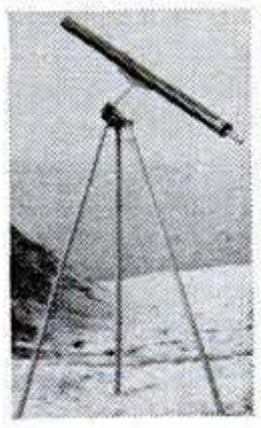

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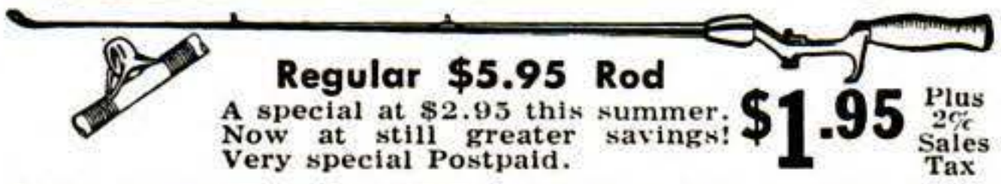

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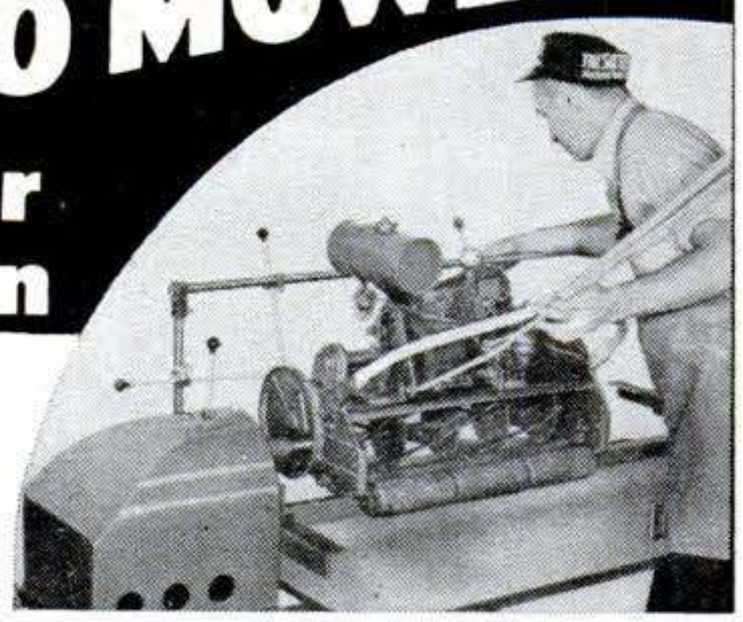

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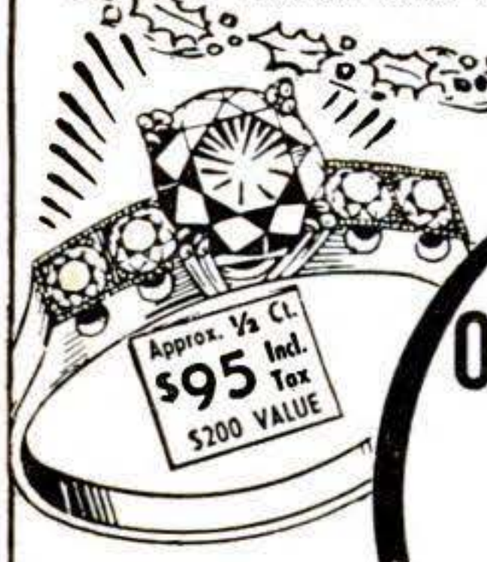

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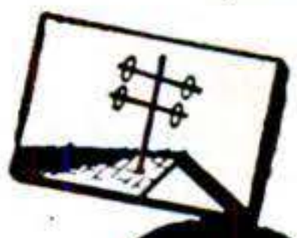

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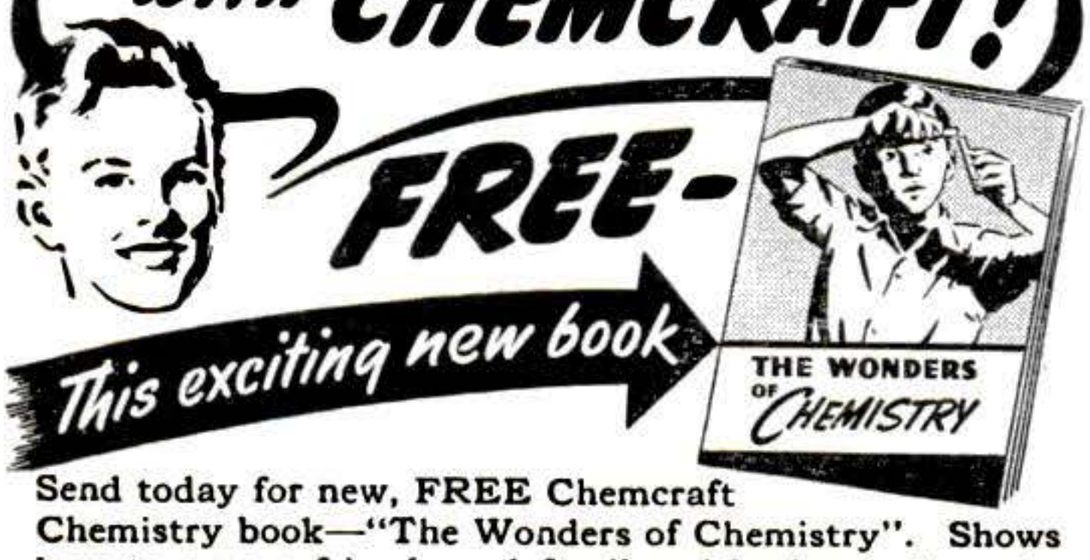

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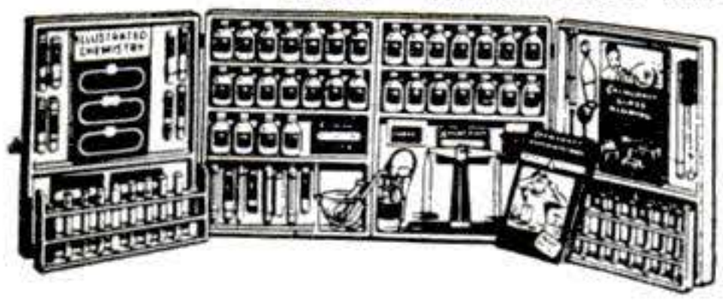

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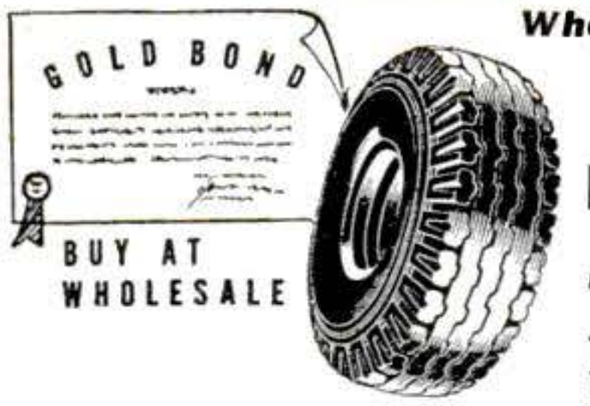

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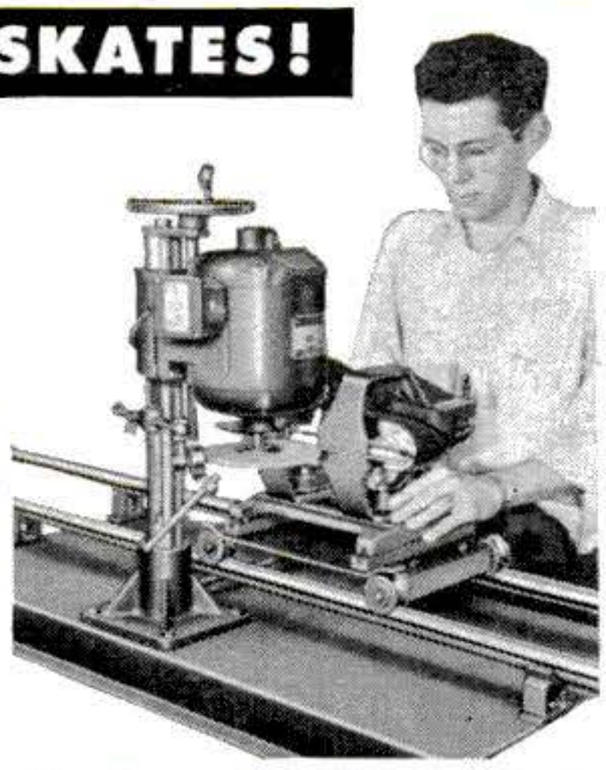

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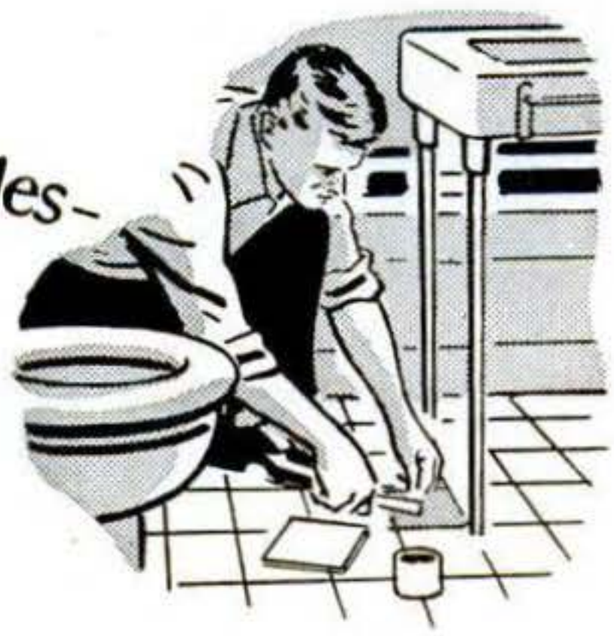

Also useful in filling cracks in floors, nail and screw holes, repairing broken toys. *Handles like putty . . . hardens into wood!*

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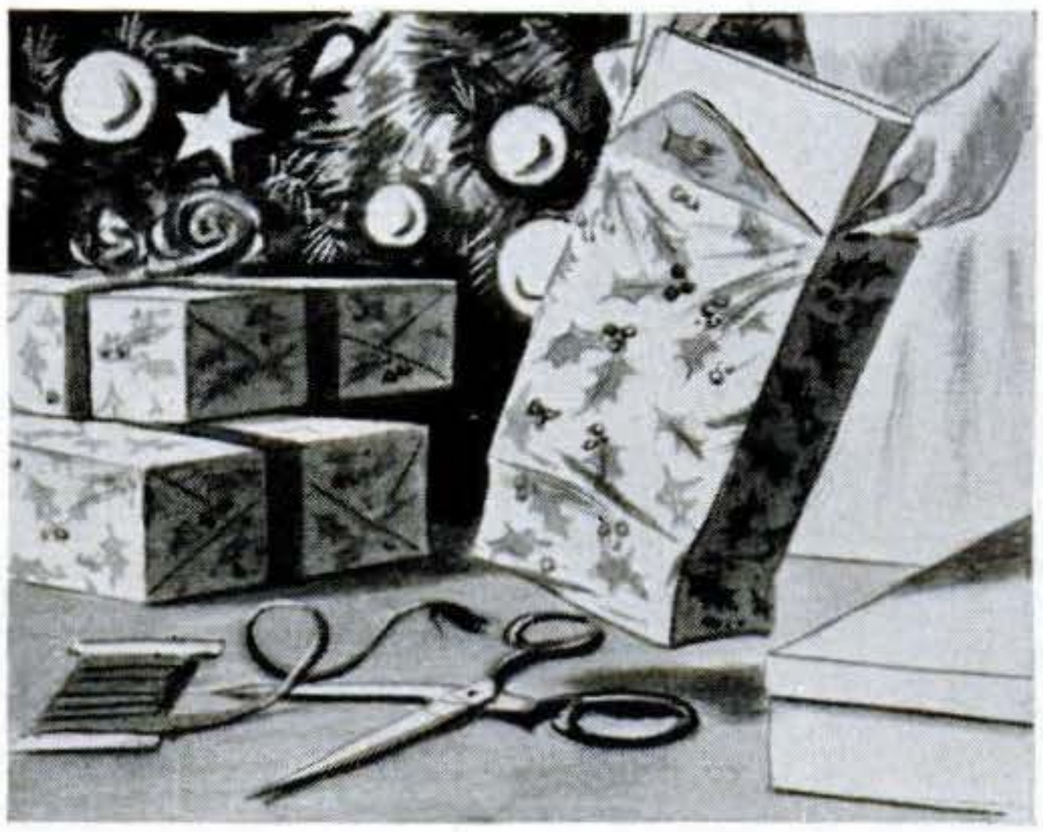
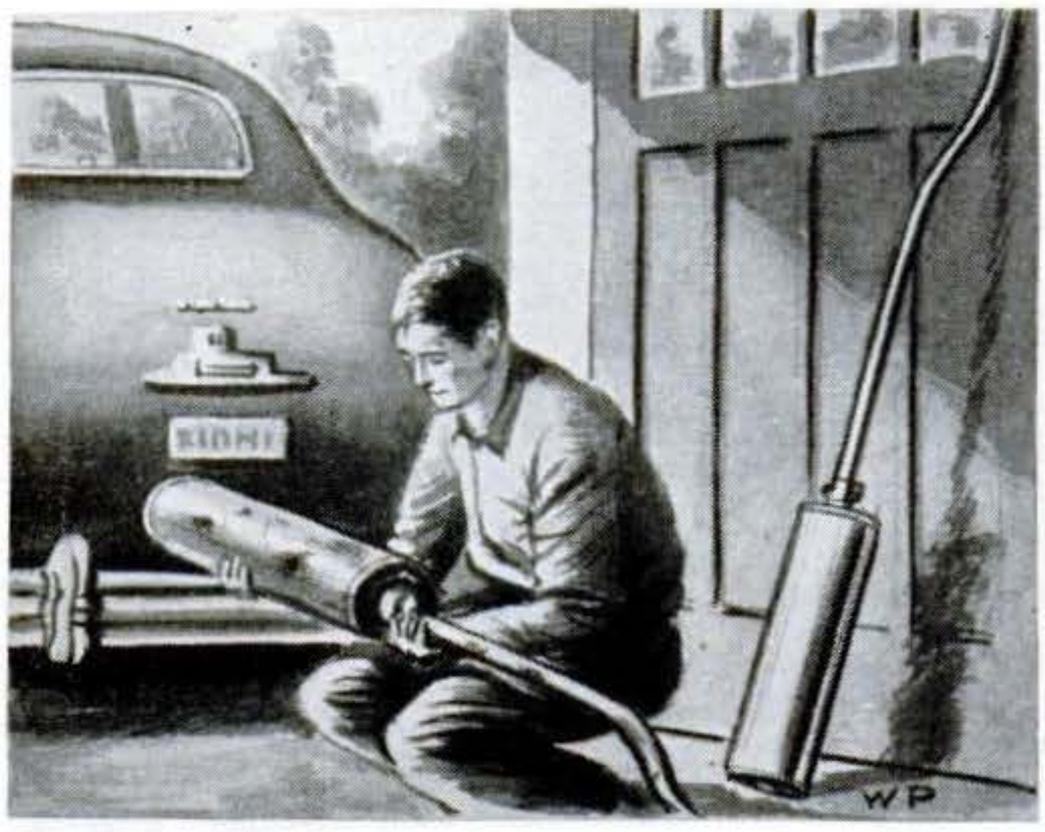


Gift wrapping paper in the shape of paper bags. Both bags and boxes could be made in various standard sizes. Then you could slip the box in the bag and fold over and seal the end. —*Richard De Grasse, Stoughton, Mass.*



Rustproof exhaust pipes and mufflers. If new cars were so equipped, you'd never have to replace a rust-eaten exhaust. Also the danger of fumes getting into the car would be lessened.—*Ronald A. Meeks, Ft. Worth, Tex.*

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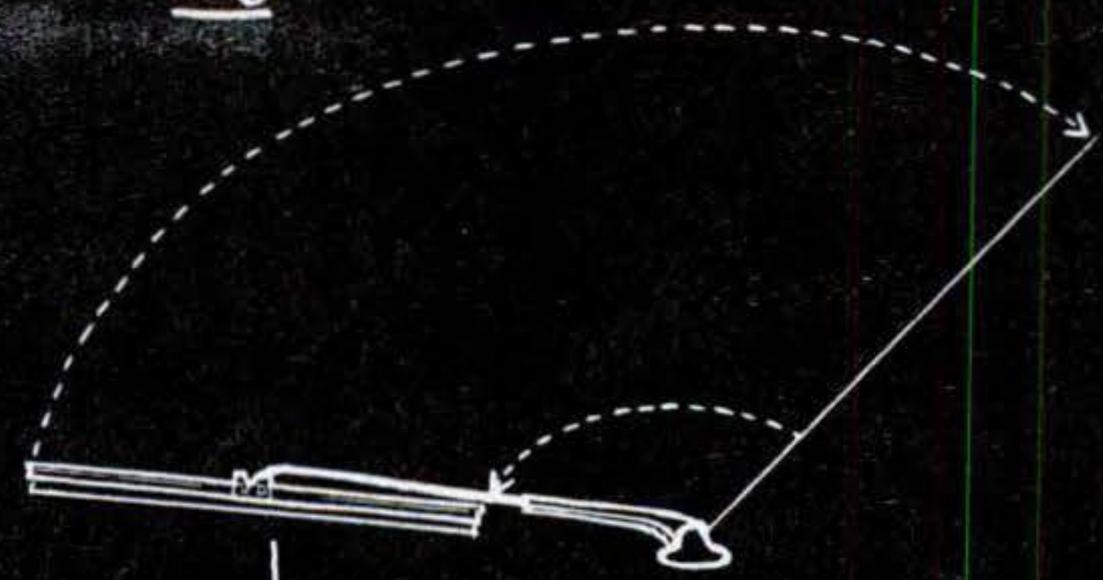
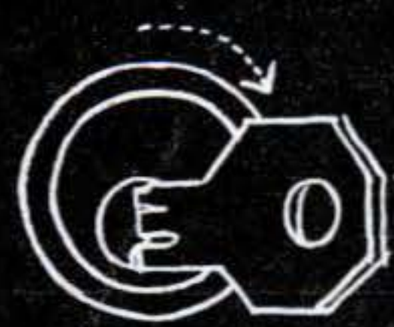
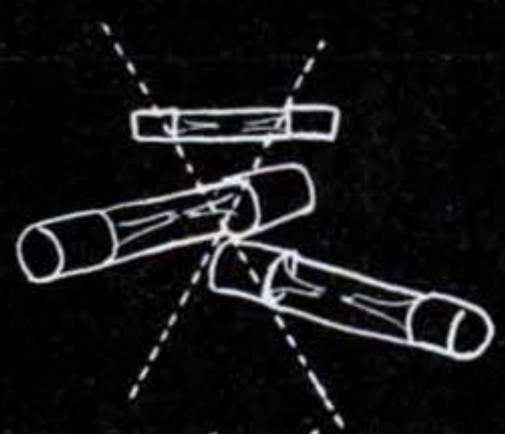
Counterbalanced luggage lid lifts at finger touch, can't fall on your head



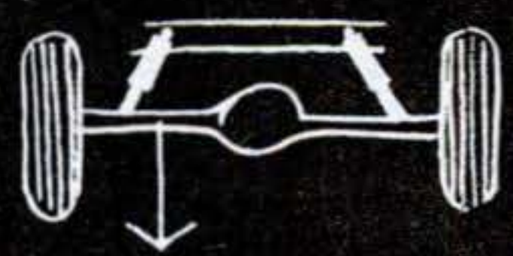
New wipers clean 61% more windshield area



Just turn ignition key – engine starts

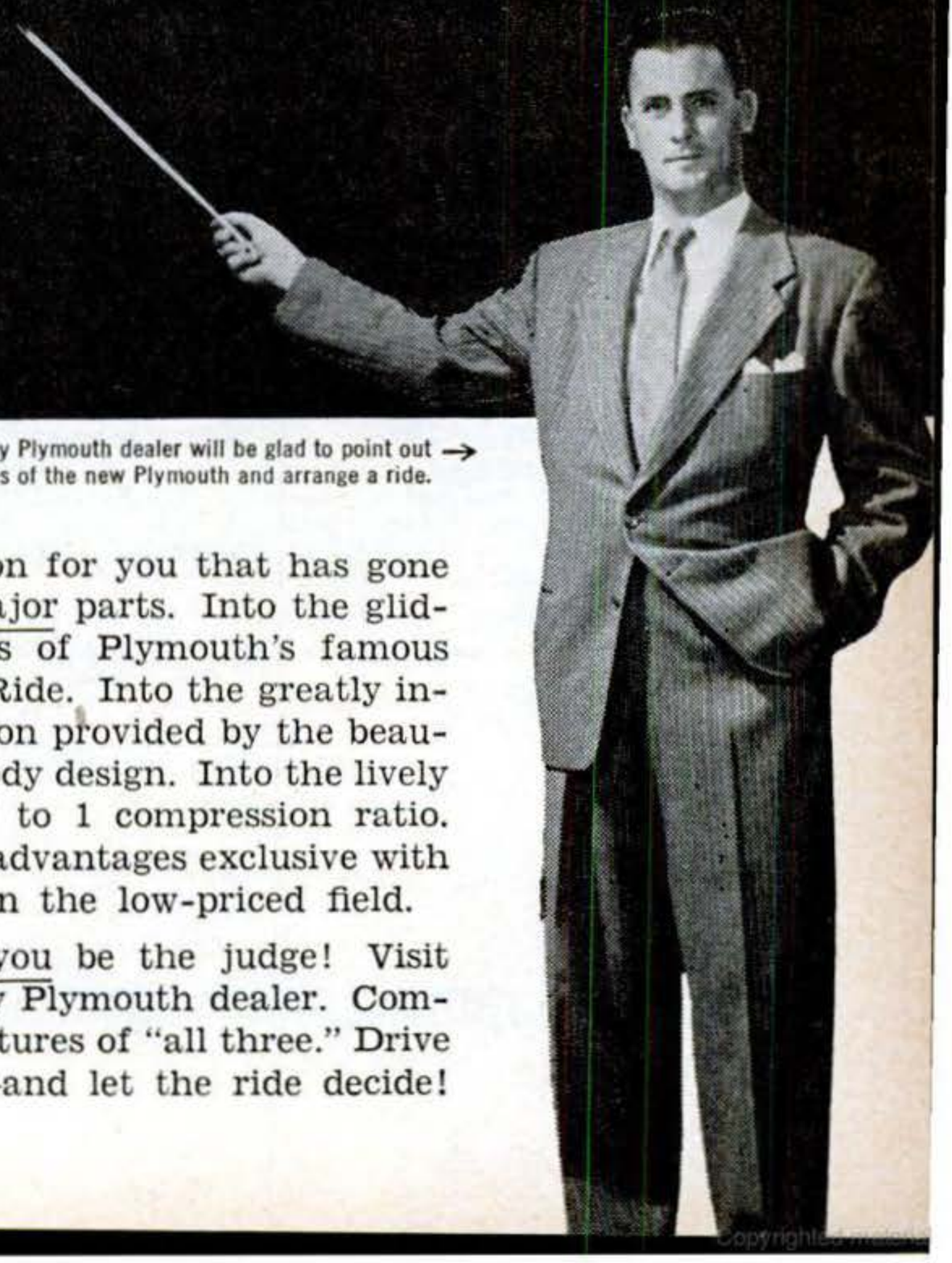


Circuit breaker protects against "shorts" no more fuses to replace



New diagonal mounting of rear shock absorbers softens ride both sideways and up & down

PLYMOUTH BUILDS GREAT CARS



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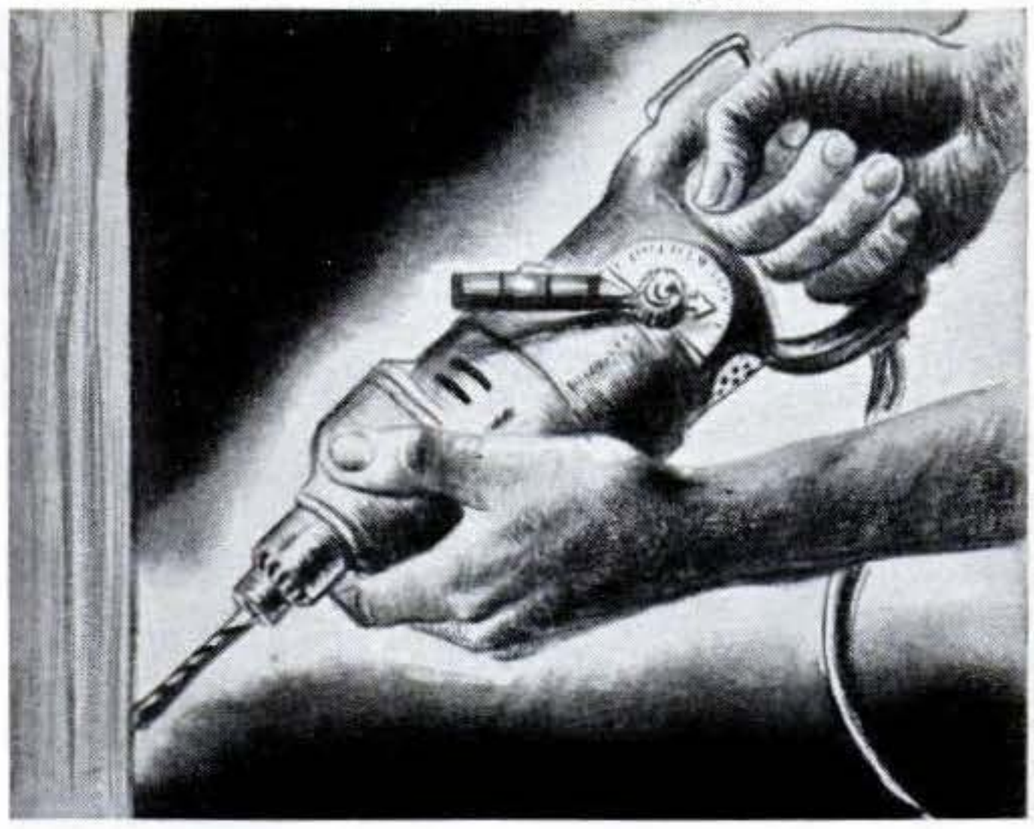
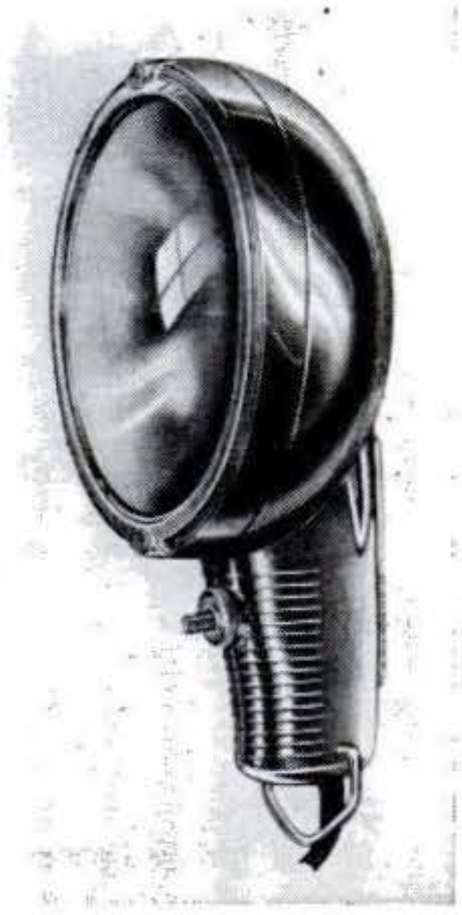


Levels and clinometers on drills. If you wanted to drill at 45°, you'd set the pointer at 45. When the drill was held with the bubble centered, you'd have the correct angle.—*John L. McClung, Port Huron, Mich.*

Bicycle crossbars that were removable. Then when little sister was ready for brother's junior-size bike, all you'd have to do would be remove the bar and she'd have a girl's bike.—*R. H. Hemfelt, Dallas, Tex.*

Trouble Light Plugs in Dash



THIS 6-8-volt, pistol-grip Hand-E-Spot® can be used as a spotlight or trouble light for cars or boats. It's equipped with an 11′ cord and a 4½″ sealed reflector. Some models plug into the cigarette-lighter receptacle; others have a separate socket and plug. The lamp is made by the Electroline Manufacturing Co., of Cleveland, Ohio.

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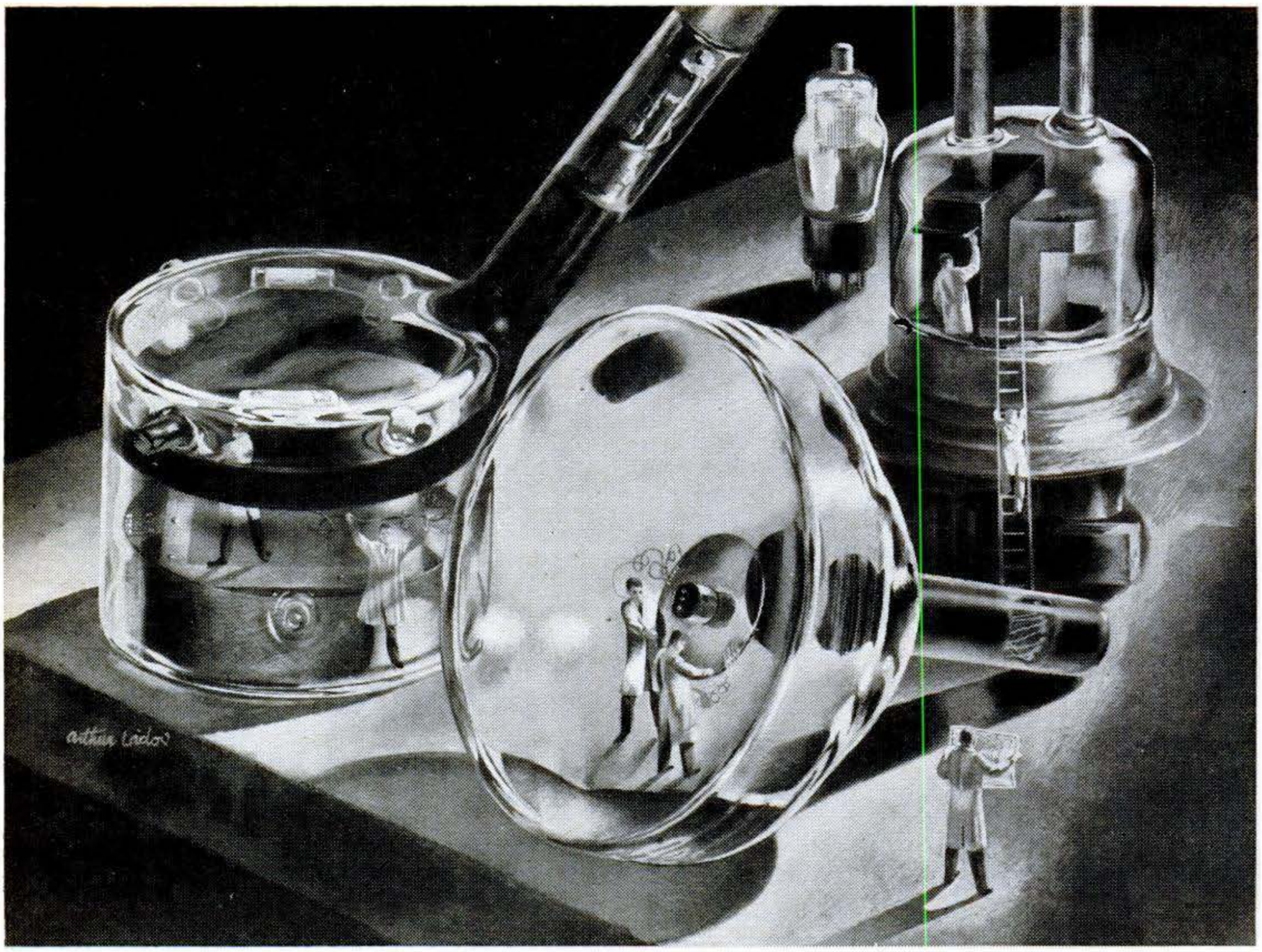

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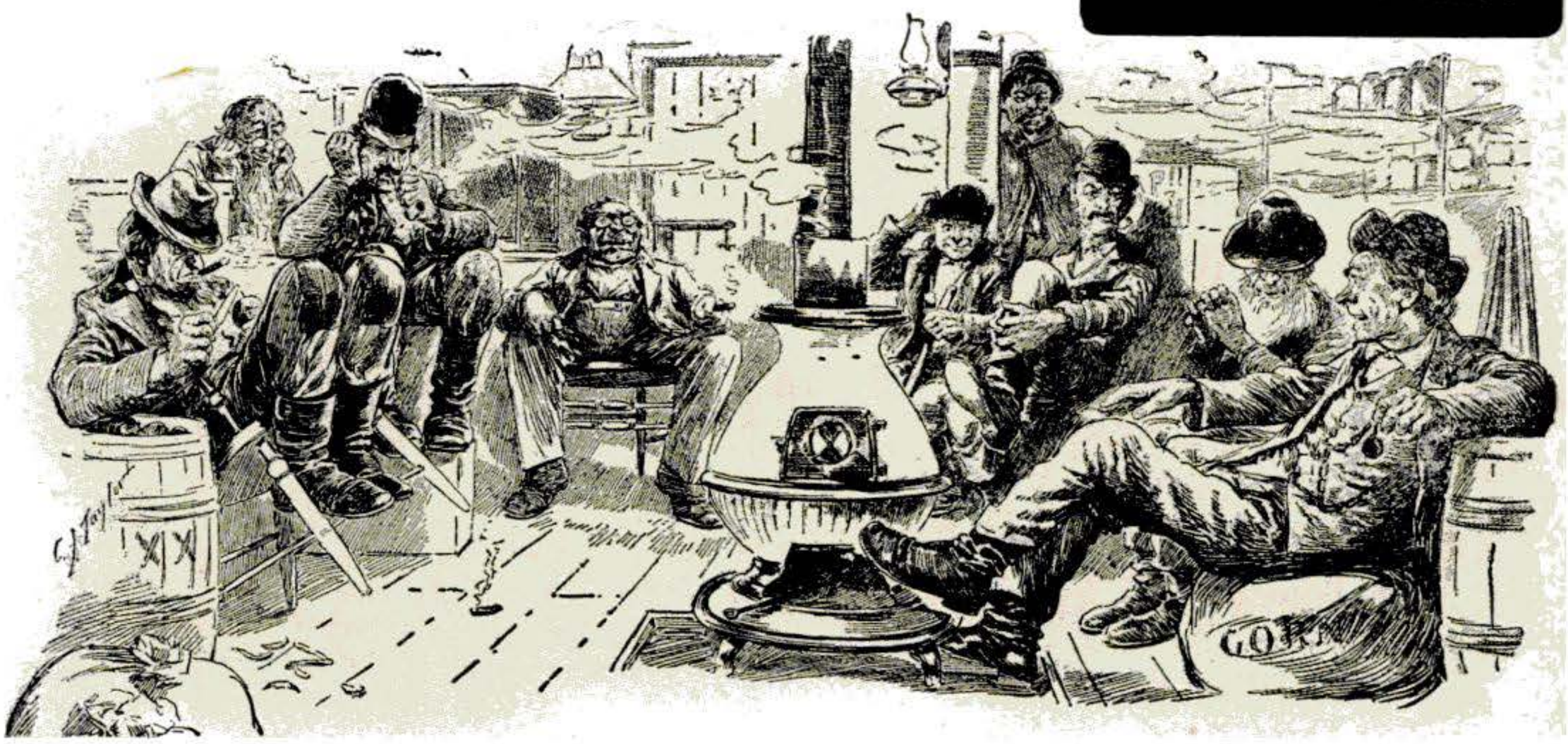

Science Can Use a "General Store"

WHEN this magazine was young, the general store was a great American institution. It was something of an educational institution as well as a market place and a local forum. A kind of proving ground for ideas and a swap shop for experience where anybody could listen—and maybe learn something.

In those days, science was hardly a hot topic around the stove. To the farmer, the merchant—even to the doctor, the school teacher, and the traveled visitor—science meant mostly such wonders as the telegraph and the steam engine.

The founder and first editor of this magazine, Edward Livingston Youmans, put it this way in his first issue:

"The work of *creating* science has been organized for centuries . . . and men of science have their journals in which they cultivate a special literature in the interest of scientific advancement.

"The work of *diffusing* science is, however, but very imperfectly organized, and we propose to contribute what we can to it in the present publication."

In the 77 years since then, the growth of POPULAR SCIENCE from a few thousand copies to a *thousand* thousand is a measure of the growth of public interest in science.

Today, the *creation* of science has been vastly expanded to include everybody. And the *diffusion* of science has become a major concern in the schools, in government and industry, and in the whole press. As science has grown great, so has the problem of diffusing its developments among its creators and users as well as to the general public.

It is natural that POPULAR SCIENCE, grown bigger, has become a kind of general store for science. A place where specialists can shop around in other fields. Where there's room around the stove for a farmer and a physicist, a kitchen chemist and a government research chief, a mechanic's helper and an industrialist.

There are thousands of ideas on the shelves, from the biggest nuclear news to the latest little gadget. As one reader recently put it, "I walk in just to look around and find myself buying something I didn't know I wanted."

Anybody can pull up a box and listen. The talk covers a lot of territory. And the cracker barrel is refilled every month.

Perry Gitkens

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What a gift for Christmas!

Prince Albert

America's Largest-Selling
SMOKING TOBACCO

★ To bring a smile to the face of any pipe smoker on your Christmas list — or to any man who likes to roll his own cigarettes — give Prince Albert! Choice, crimp cut tobacco — mild and full-flavored! And the big one-pound tin comes gift-packed in a colorful Christmas package — with a "built-in" gift card right on top!

R. J. Reynolds Tobacco Co., Winston-Salem, N. C.

THE NATIONAL JOY SMOKE

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Cosmic Cave . . . Lowell M. Bollinger went back to the salt mines—and took his 48 Geiger counters with him. A Cornell University researcher, Bollinger is now studying how cosmic rays penetrate the 2,250 feet of earth—almost half a mile—over this salt-mine shaft near Ithaca, N. Y. Automatic cameras record what the counters register. Later, he will move his equipment to another shaft extending under Lake Cayuga to see how a water layer affects cosmic-ray absorption. That's not a cosmic explosion over his head—just an unshielded light bulb. The Geiger counters are attached to the large drum.

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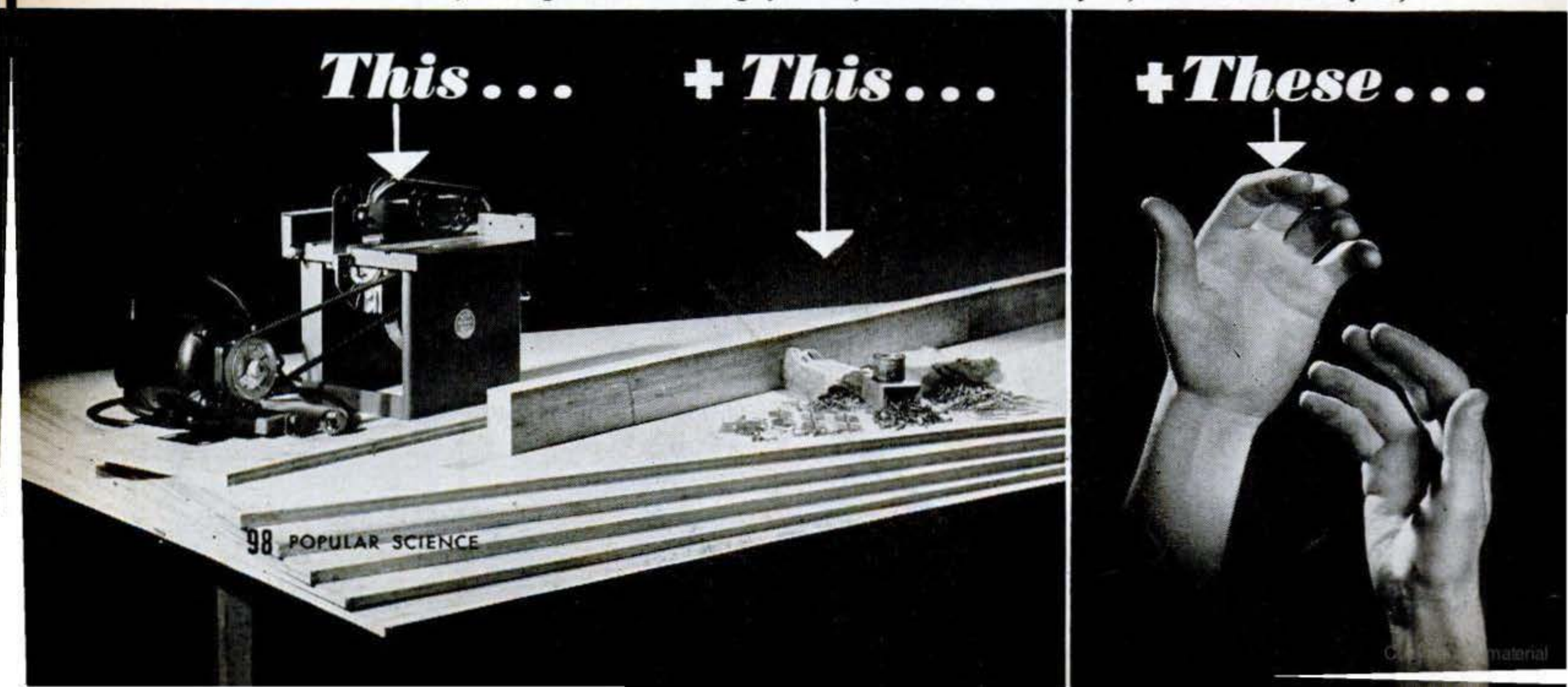
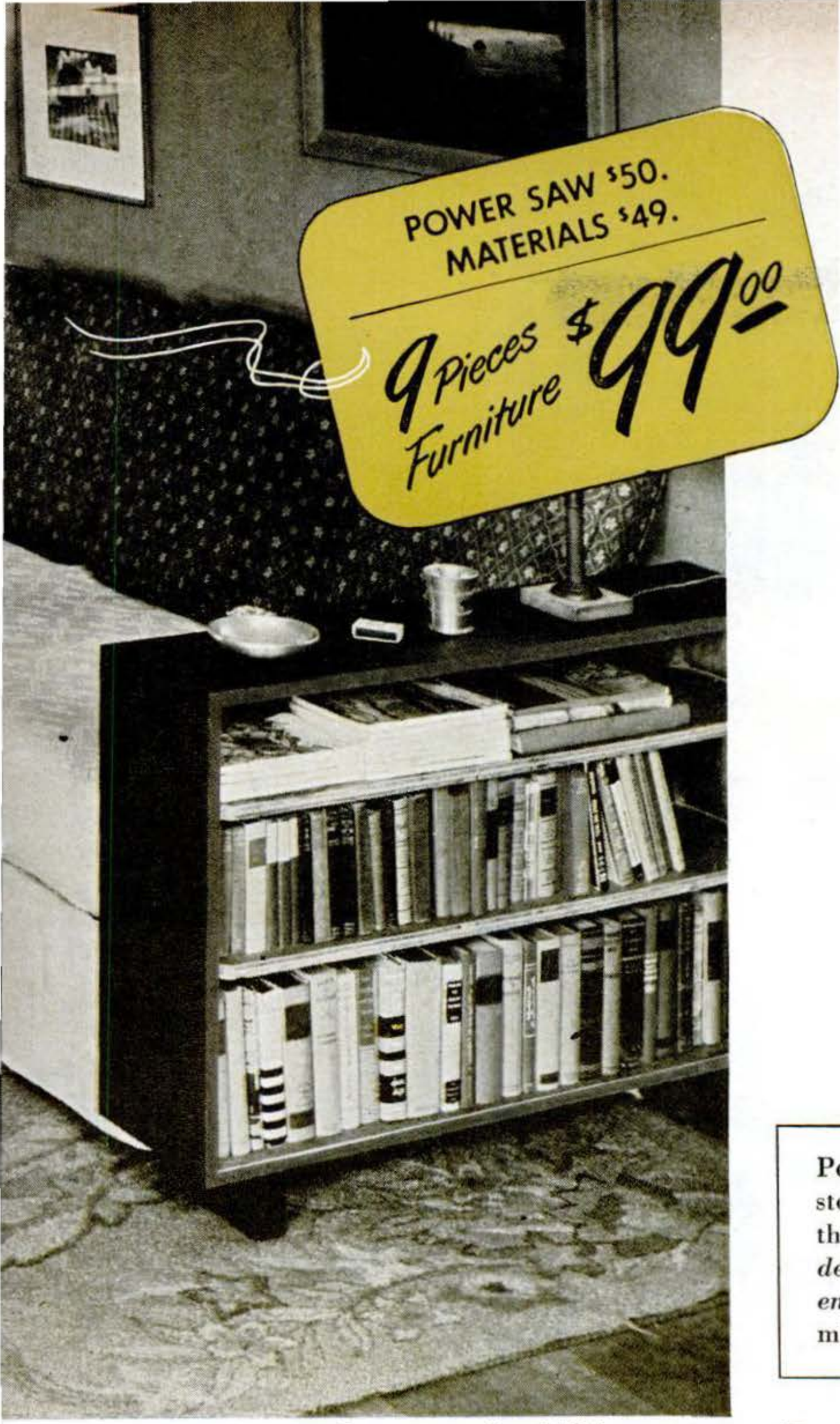
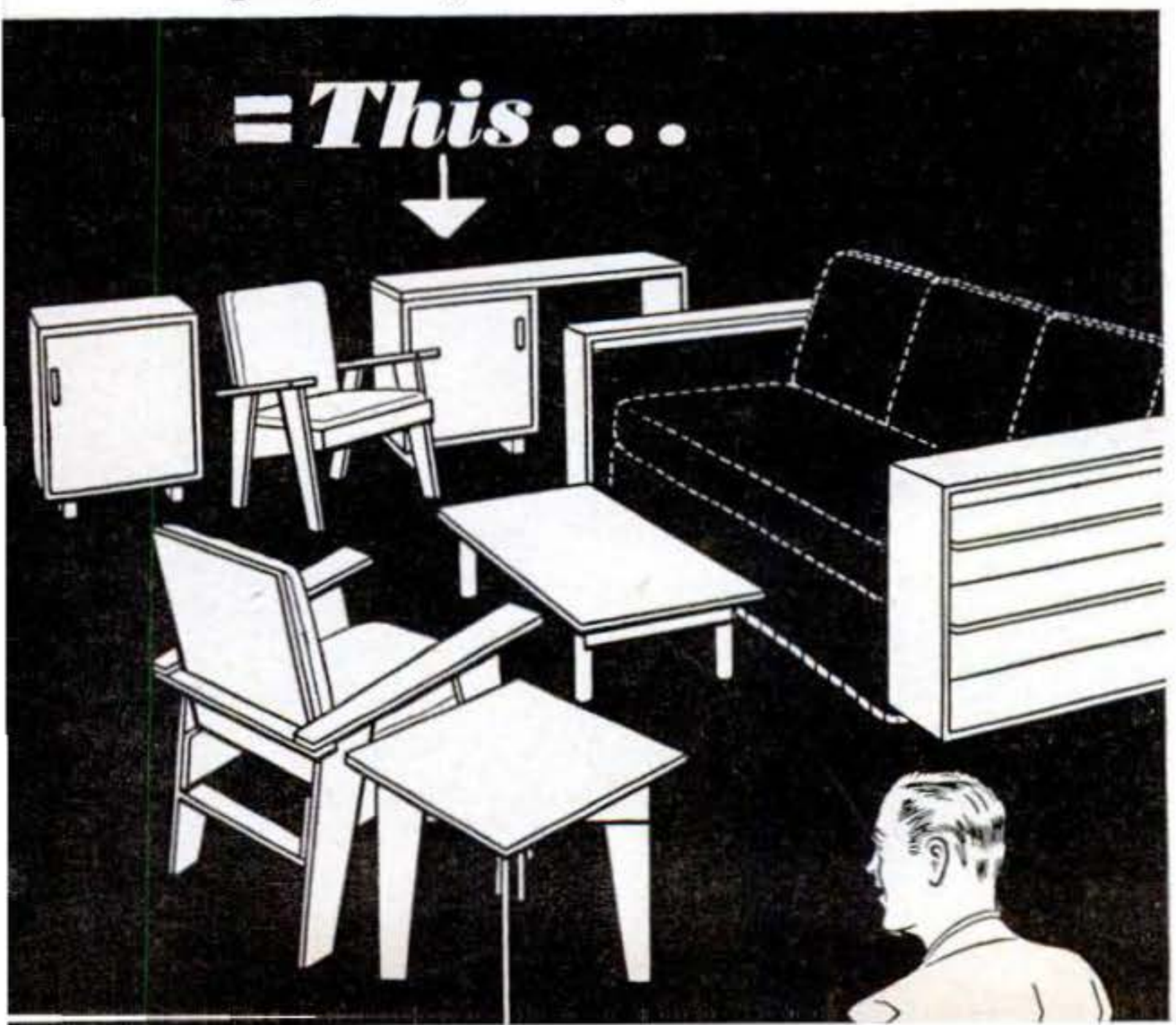
This roomful of furniture is quite a buy at $99—particularly when that price includes the

The raw materials—saw, five panels of fir plywood, 16 ft. of 2 by 4, 15 ft. of 1 by 1,





cost of a circular saw and a 1/3-hp. motor. glue, nails, screws, and common hardware.



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Everybody's Furniture Anyone Can Make

POPULAR SCIENCE presents the biggest story in machinery for living since the three-legged stool: BASIC FURNITURE *designed* for maximum comfort and taste; *engineered* for home manufacture with minimum money and skill.

By George H. Waltz, Jr.

PS photos by Hubert Luckett
Drawings by Morris Cohen

"GOOD furniture costs too much for most people!"

"Cheap furniture isn't good enough for anybody!"

Those two facts fused the explosive beginning of one of the most important and interesting stories I have ever reported.

Important because it offers people like you and me a chance to break through the vicious circle of the high cost and low quality of the basic tools of living we use around the clock.

Interesting because it applies the most modern engineering methods to the pro-

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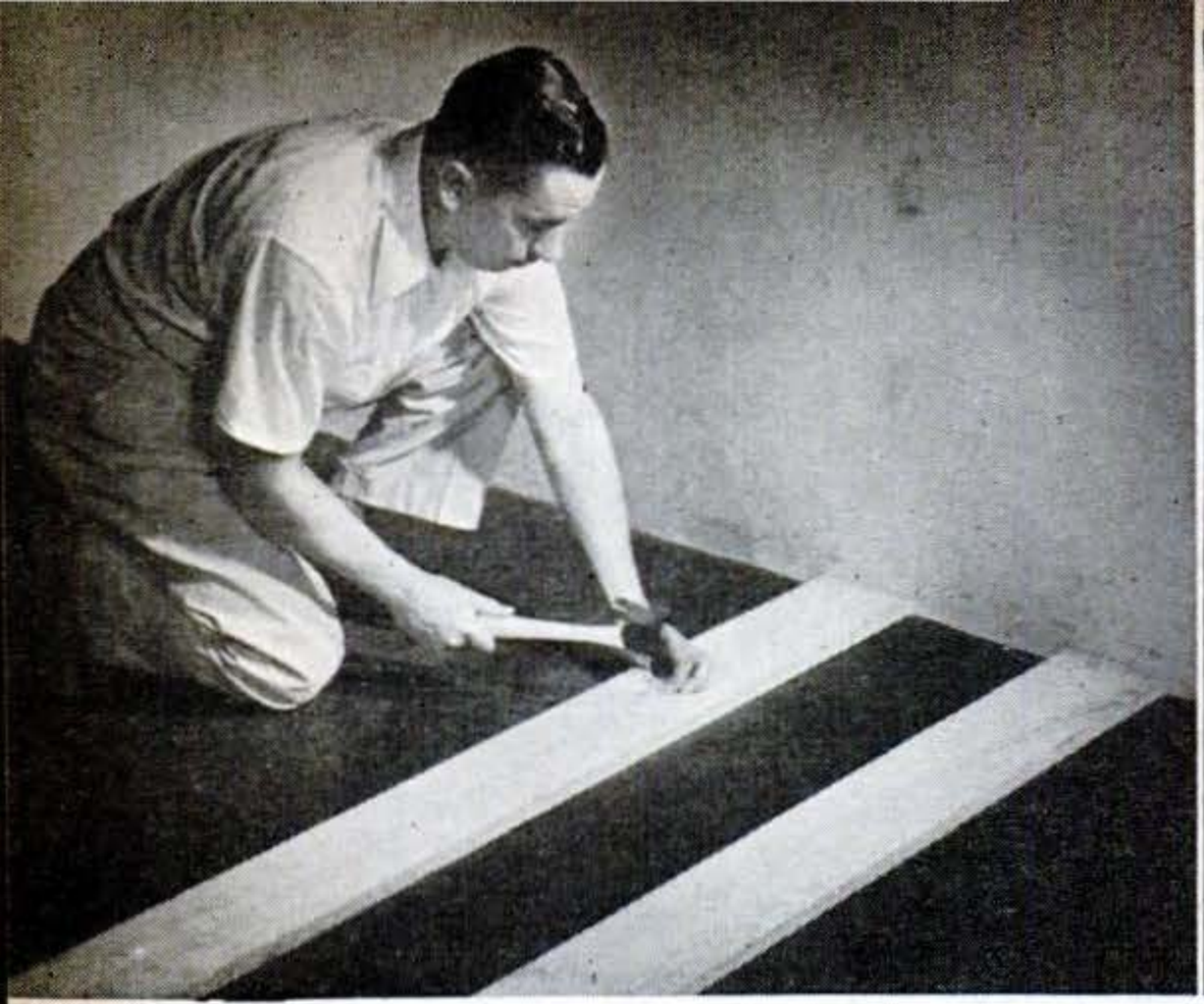
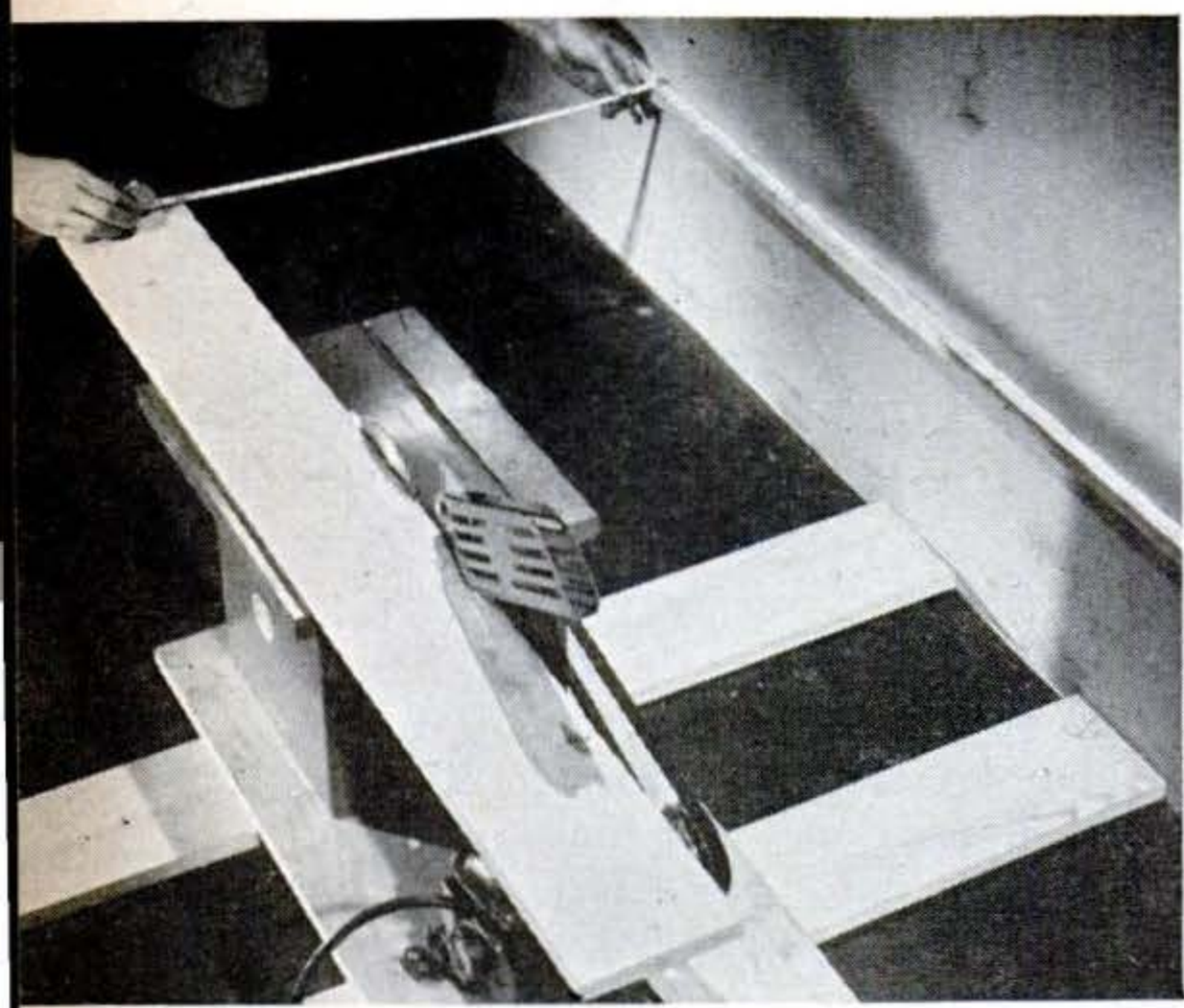
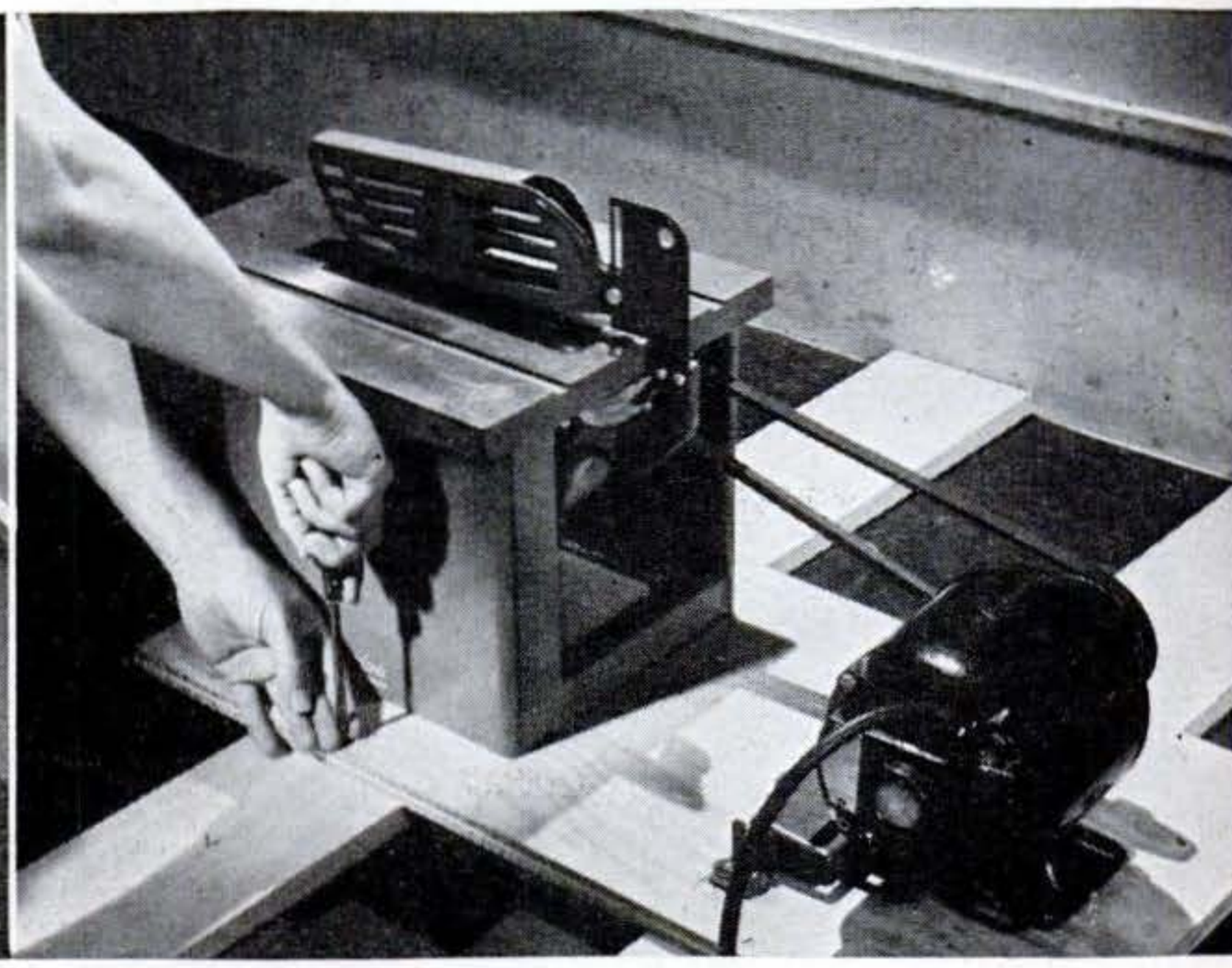


1 **A saw jig** simplifies cutting the plywood panels. Here two rails, on which the baseboard carrying the saw and its motor will slide, are being toe-nailed to the floor.

2 **With the saw and motor** bolted to a base, place the entire assembly on the two rails, and carefully measure the height of the saw table from the floor.



4 **To set saw for cut,** align long, straight board flush against blade (hold with C clamps if available). Move saw until board edge parallels wall at desired width of cut.



5 **Then fasten** the saw-and-motor mounting board in that position with screws driven into the two rails. It is very important that the blade and wall be exactly parallel.

duction of plain, functional, sturdy furniture right in the room where it will be used. No shop, no skills beyond the ability to drive a car or a nail are needed.

Two angry men are responsible for smashing the harsh fact that only those rich enough in money or skills can get good, livable furniture. One is the Editor of this magazine, who has toured the business from the plush places to the borax* parlors and the factories.

The other is a successful young designer-engineer, Klaus Grabe (pronounced Grah-bay), who has made considerable fame for himself by designing furniture for good living, put out in inexpensive kits for home assembly.

When I first brought the two men together, their common hopes and hates merged into these quotes:

"The 'Beautiful Home' magazines are full of pretty colored pictures of the charming living rooms of struggling young couples who did the whole thing for a mere $1,778."

"Yeah—Pamela made the lampshades out of her old evening gowns; Jeffrey whittled the coffee table out of an old Steinway he found in the gutter. Then Dad, delighted at

*Trade term for cheap stuff slicked up to sell high, especially in installment houses.

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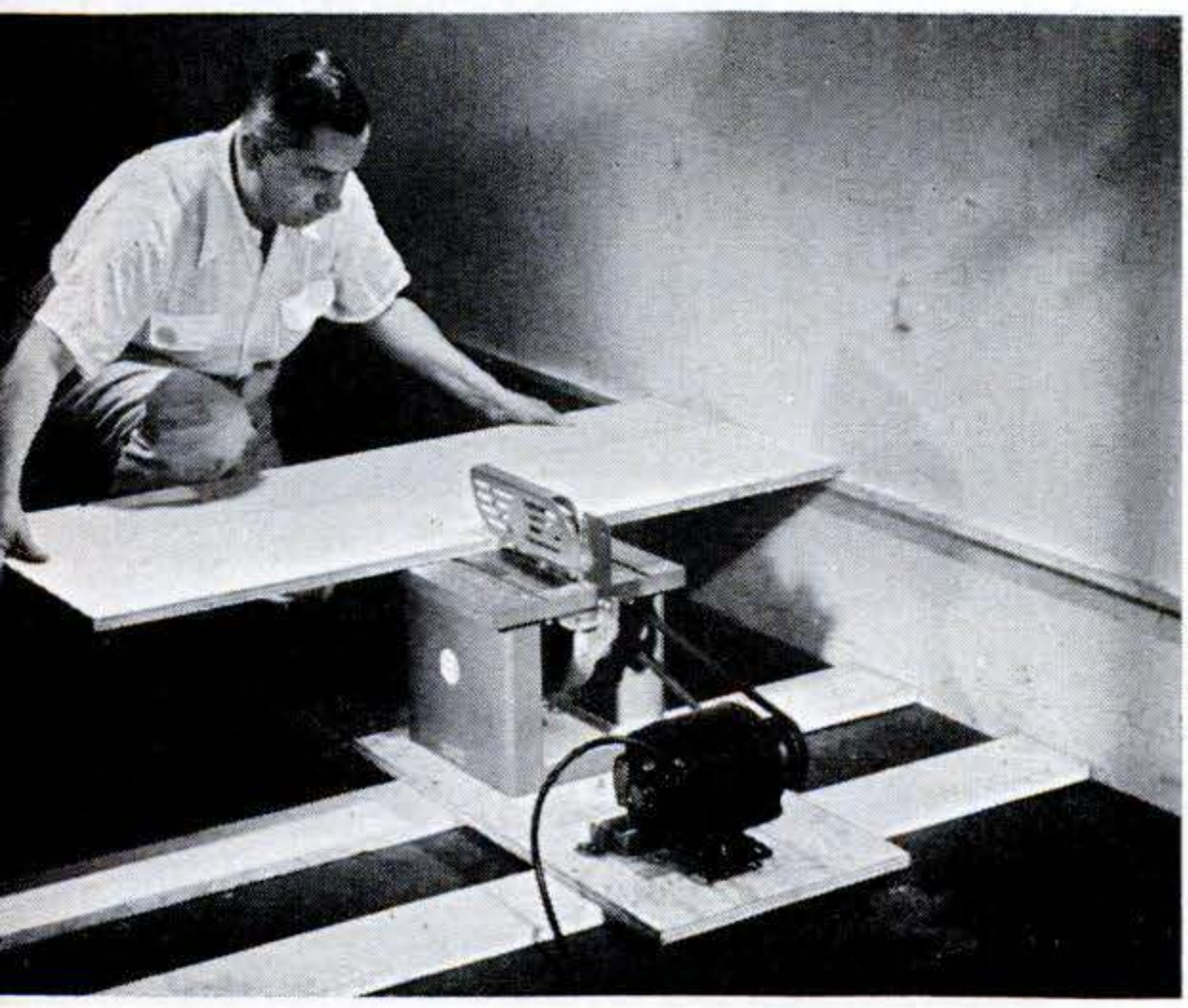
3 **The height of the saw table** from the floor gives height for the cutting guide—a 1-in. by 1-in. strip nailed to the wall. This strip later is used for drawer slides and handles.



6 **The completed saw jig** in use. Remove the screws and reset saw nearer or farther from wall for cuts of different width. Wall and 1 by 1 strip serve as the rip fence.

the display of independence by the youngsters, shucked out a check for the darling little divan, such a bargain, really, at $499, and Mother found the dear little antique bed, table, and chairs that Pam and Jeff refinished completely with one 10-cent can of shoe polish!"

We agreed that plain Jane and John, minus the bucks, would never make the Kodachromes in "Beautiful Home." Their problem, the problem of everyone with a new life, a new child, and the same old paycheck, is what to put around the box spring and mattress. Unpainted furniture? Junk! Make their own? Sorry, no old evening dresses—and besides, John couldn't saw a straight line in a cake of soap.

But Detroit cranks out seats in cars that are so good you could almost put arms on them, sell the chassis, and save money. How come? Modern manufacturing techniques.

That's how the idea for "Basic Furniture" was born—to make the simplest possible living tools to *sit* on, *eat* off, *sleep* on, *keep* things in. Plain Jane-John furniture planned around two basic units of measurement: the standard twin-size box spring and mattress and the standard four- by eight-foot sheet of plywood. "Beautiful Home" would call it "dual-modular construction."

I call it a miracle of design, procedure planning, and wood engineering—and I'm an engineer as well as an ex-teacher of manual training with a full knowledge of tools and traditional methods. I watched this set of furniture as it was designed from the floor up. I saw it grow from rough thinking-on-paper sketches to the finished pieces. And, because I have the skills, I can say with some authority that *no woodworking experience whatever is needed.* All the thinking, calculating, and product engineering has been done. You don't need a workshop, a tool kit, or even a bench.

Set Up Your Own Factory

By setting up a temporary factory right on the floor of the room to be furnished, you can fill it with these pieces of furniture: two roomy cabinets with doors, two comfortable armchairs, a king-size coffee table, an occasional table, a desk, and a bookcase that, with a bed-clothes storage cabinet, doubles as headboard and footboard for a twin-size box-spring and mattress mounted on blocks or inexpensive screw-in legs.

You start with five panels of plywood, some two-by-fours, hardware, glue, paint or wax, and a power saw. You end up with some miscellaneous sore muscles, a pile of sawdust—and *the nine pieces of honest, sturdy, usable furniture* pictured on the cover and detailed in this article. You spend your time, and a little under $100 total—*and you still have the saw* that accounts for about half the cost.

So you're no good with a handsaw. And you are afraid of a power saw? You should be. It's exactly as dangerous as the fan in your car or your office, the electric mixer in the kitchen, a power lawn mower, or your razor. People have learned to live with

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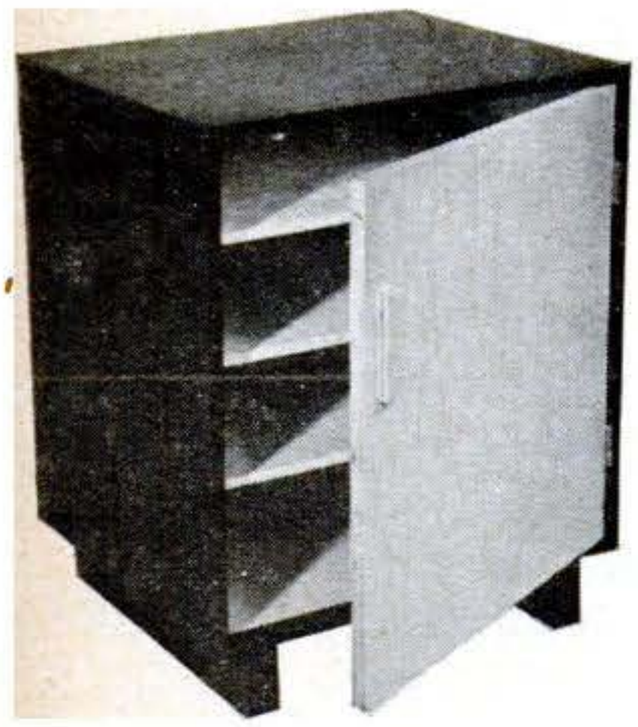
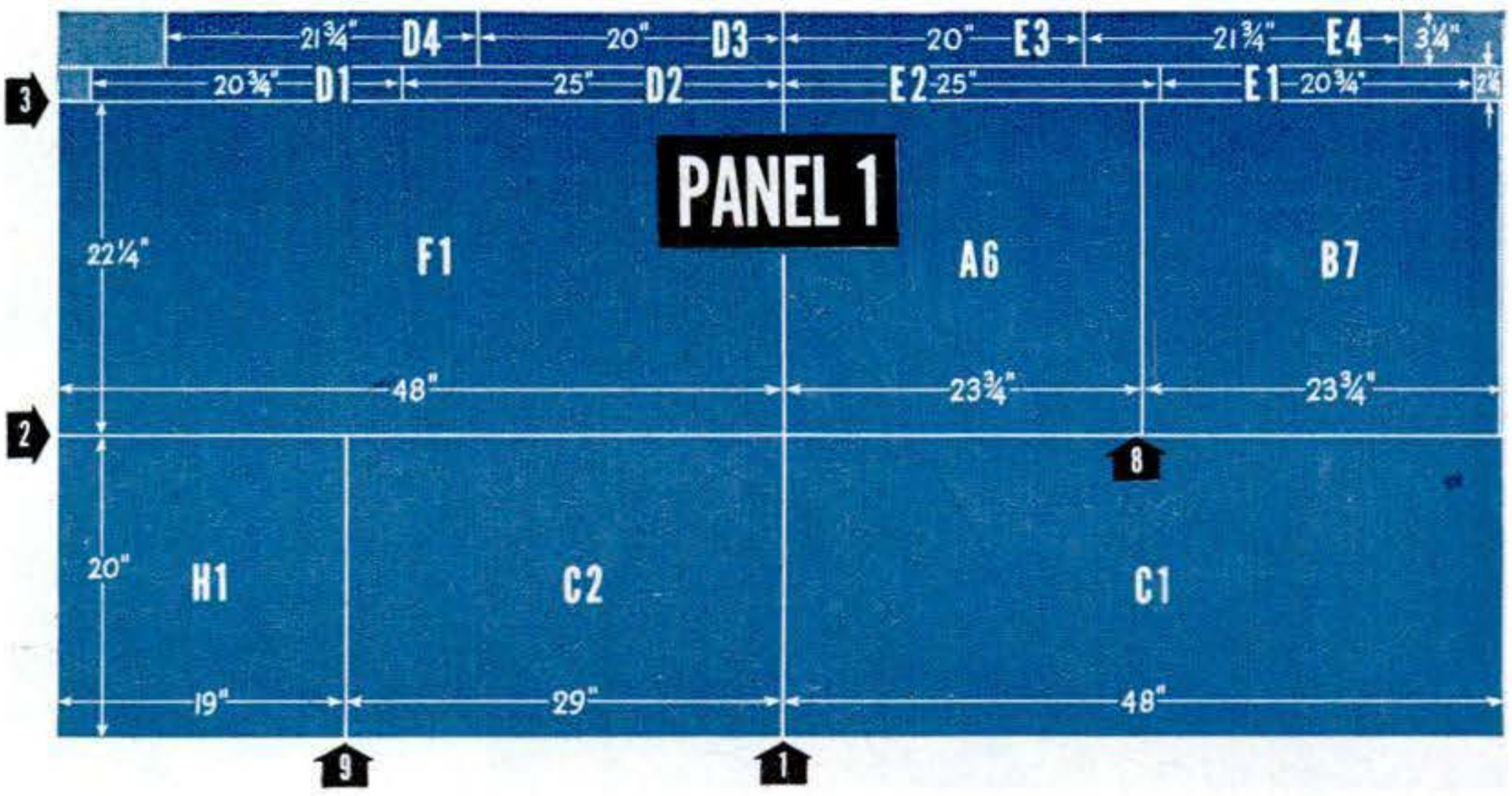
CUTTING THE PANELS

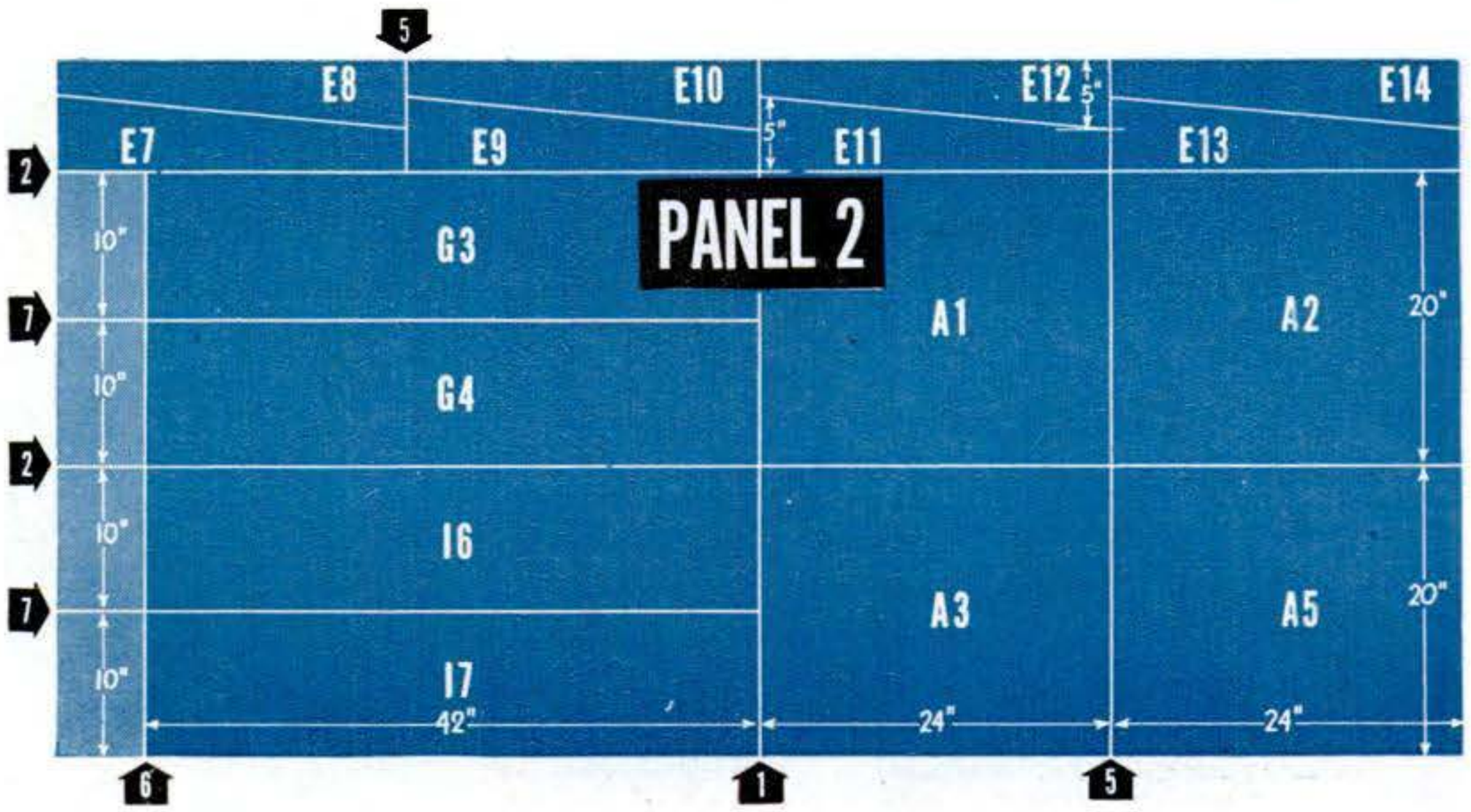
GETTING nine pieces of furniture out of five 4- by 8-ft. plywood panels (panels 1, 2, and 3 are ¾ in. thick; panels 4 and 5 are ½ in.) requires careful planning. The planning, however, has already been done for you. All you have to do is make the cuts indicated *in the sequence indicated*. If you have cut No. 1 made at the yard where you buy the lumber, this will save you the bother of having to wrestle with sheets 8 ft. long. You will then start work with ten 4- by 4-ft. panels and will begin by making the cut indicated as No. 2. If you will mark the parts on the panels as shown, using A for all the parts for chest A, B for all the parts for cabinet B, and so forth, it will be easier to sort the parts later on. When you get around to making the cuts Nos. 5, 6, and 7, use the dimensions merely as a guide. Set the saw so the cut will come in the exact middle of these large pieces.

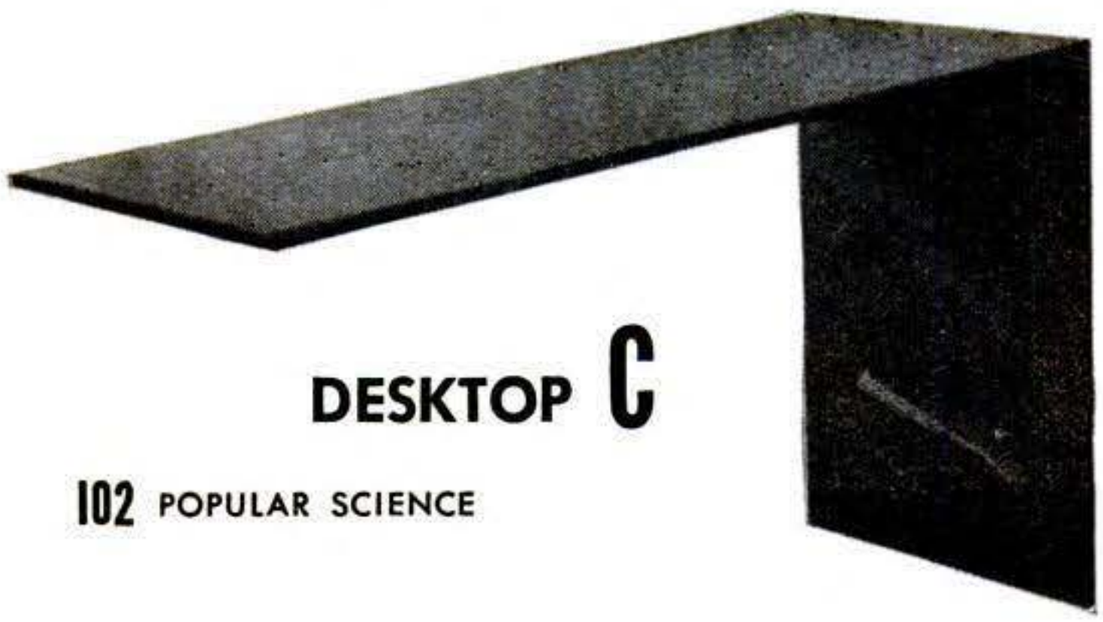


CHEST A



CABINET B





DESKTOP C

CHAIR D

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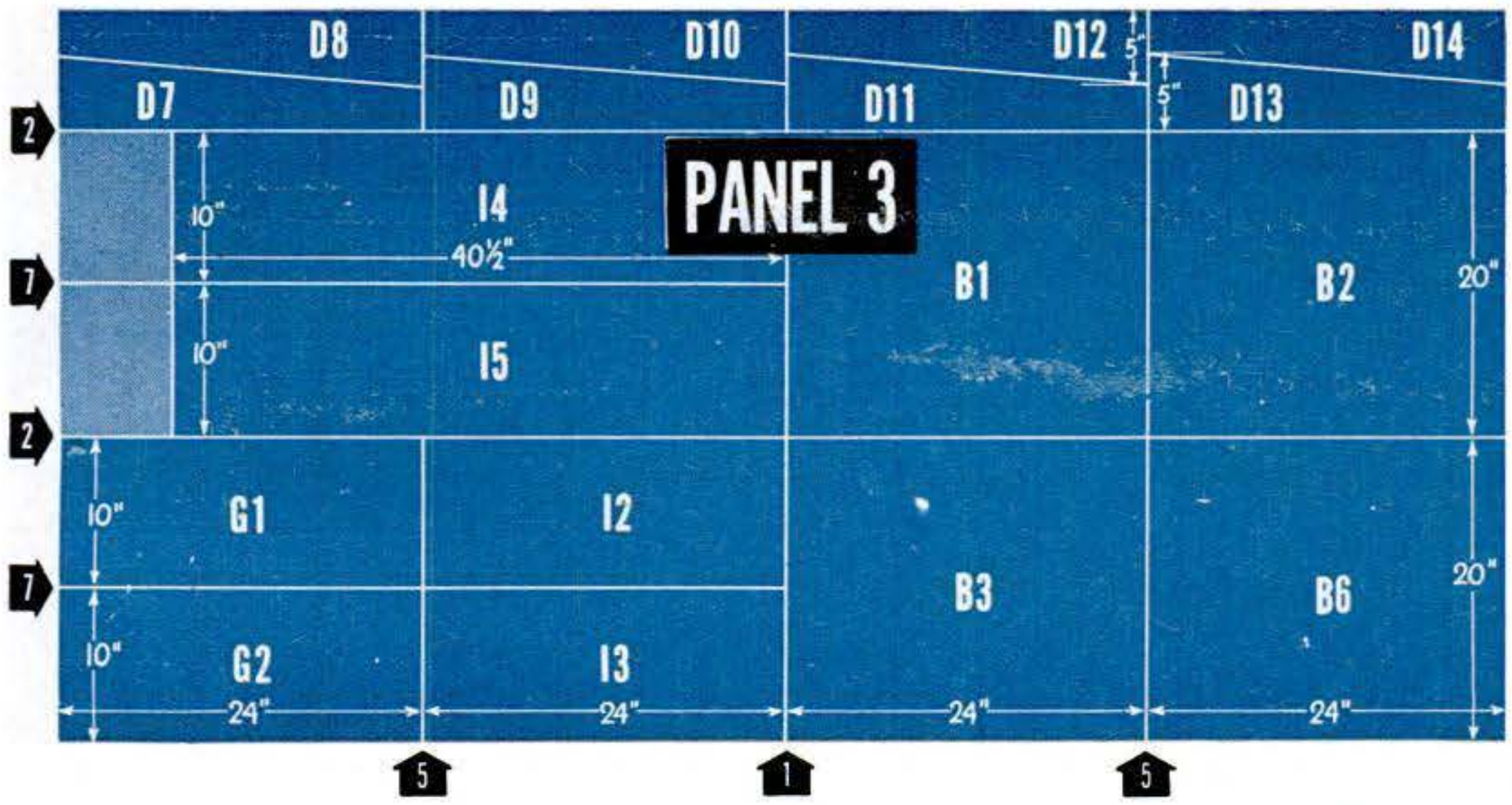


BOOKCASE I

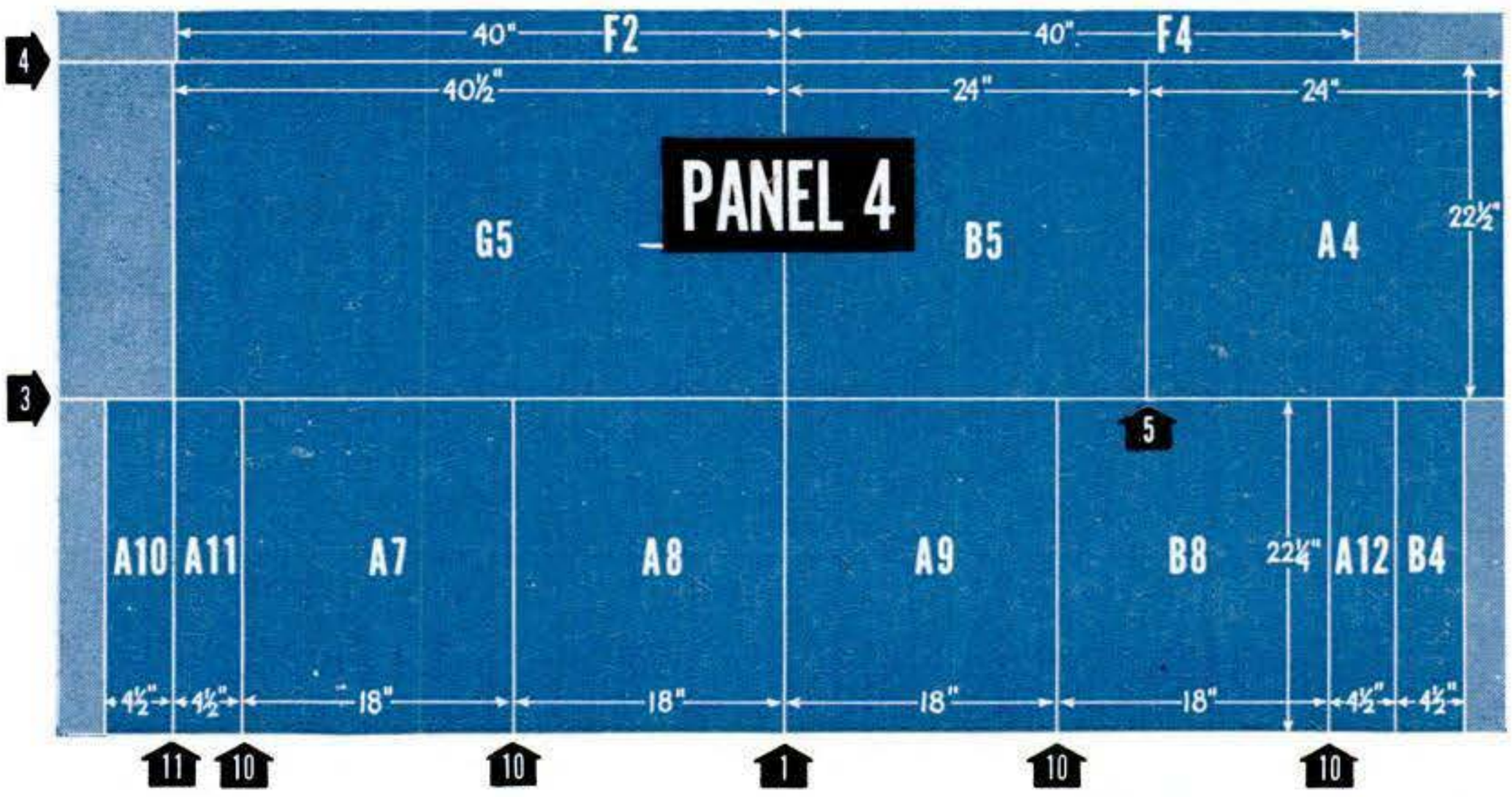
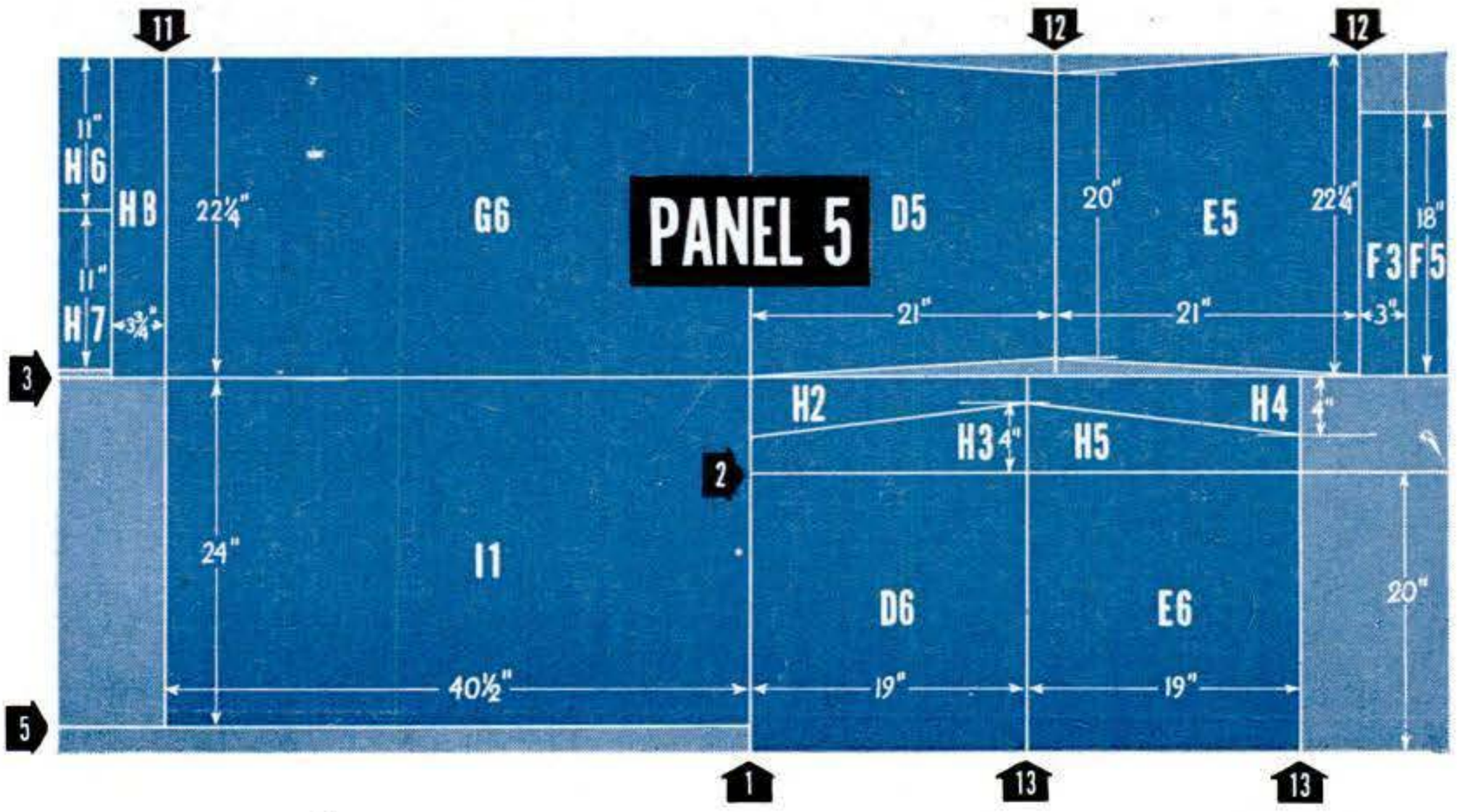
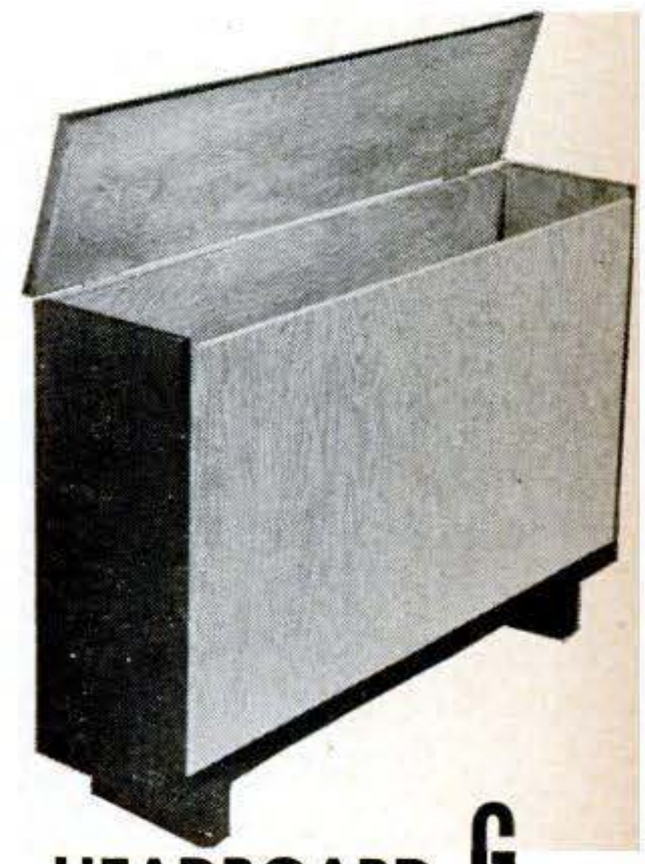


TABLE H





HEADBOARD G

CHAIR E

TABLE F

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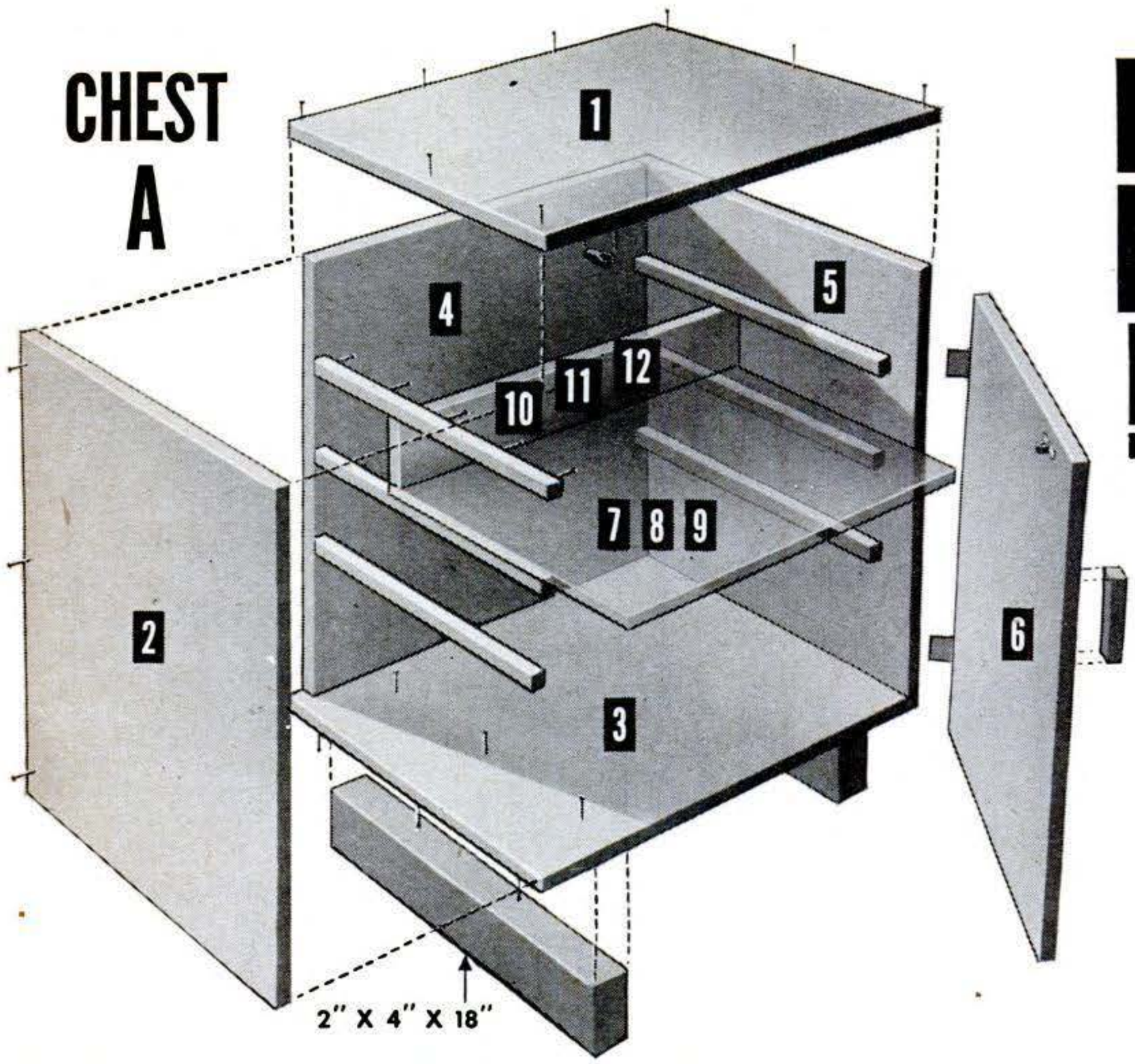

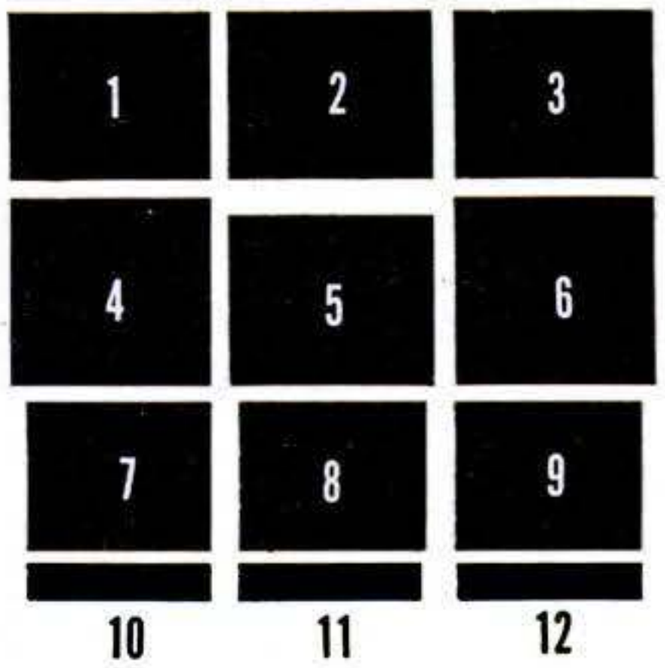

Assembling chest A, you will find that you have 12 pieces cut from the plywood panels. To these, you must add two legs cut from the 2 by 4 and six drawer slides and a door handle cut from the 1-by-1 strip—the piece that served as the improvised rip fence and guide in the original saw jig.

many dangerous things, including gasoline, grade crossings, and electric lights in the bathroom that can kill you quick if you put a bare foot in the toilet and a wet finger in the socket!

The big dangers in using a power saw are sticking your fingers into the blade, and handling large pieces of wood. The first can be avoided by keeping your fingers away from the blade just as you keep them away from razor edges, light sockets, and hot stoves. The second has been solved by Klaus Grabe's development of what in industry are called "jigs" and "fixtures." A rotary can opener consists of a "fixture" that holds the can and a "jig" that positions the little round cutting wheel where it will do the most good when you turn the crank on the side.

In the Grabe plan for home manufacturing, the floor is your workbench, the wall is your cutting guide. By simply positioning the saw as directed you make a measurement *once*, shove the wood through again and again, and then make the next setup. Grabe has engineered the whole process so carefully, has planned the cutting layouts so frugally, that there isn't enough waste wood to make a house for a humming bird. Even the possible errors between you and the saw have been so arranged that they cancel out in the assembly. It's all straight cutting, no hard curves, no mortises, dovetails, dowels, or fussy practices.

You begin by shopping for a power saw.

Here's What You Need

1 circular saw and motor
3 4- by 8-ft. ¾-in. plywood panels
2 4- by 8-ft. ½-in. plywood panels
16 ft. of 2- by 4-in. stock
15 ft. of 1- by 1-in. stock
1 lb. of 2-in. finishing nails
16 ¾-in. No. 8 flathead wood screws
1 box of 1¼-in. No. 8 wood screws
½ box of 1¼-in. wire brads
1 can of plastic-resin glue
2 2-in. corner braces with screws
2 spring door catches
6 2- by 2-in. hinges, fixed butts
4 rolling pins for coffee-table legs

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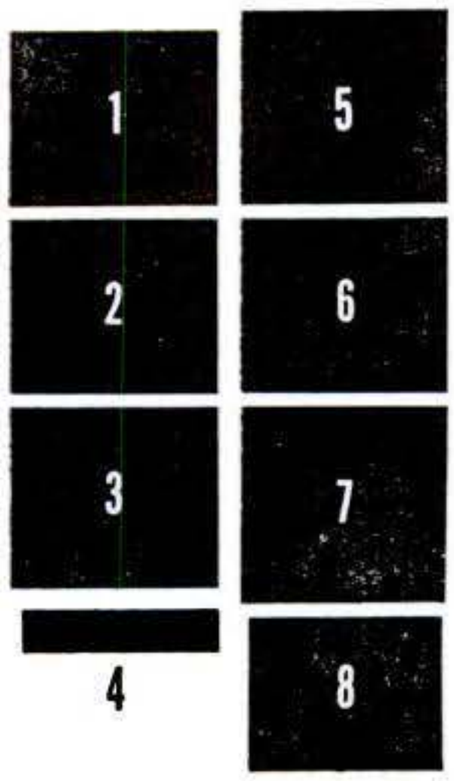
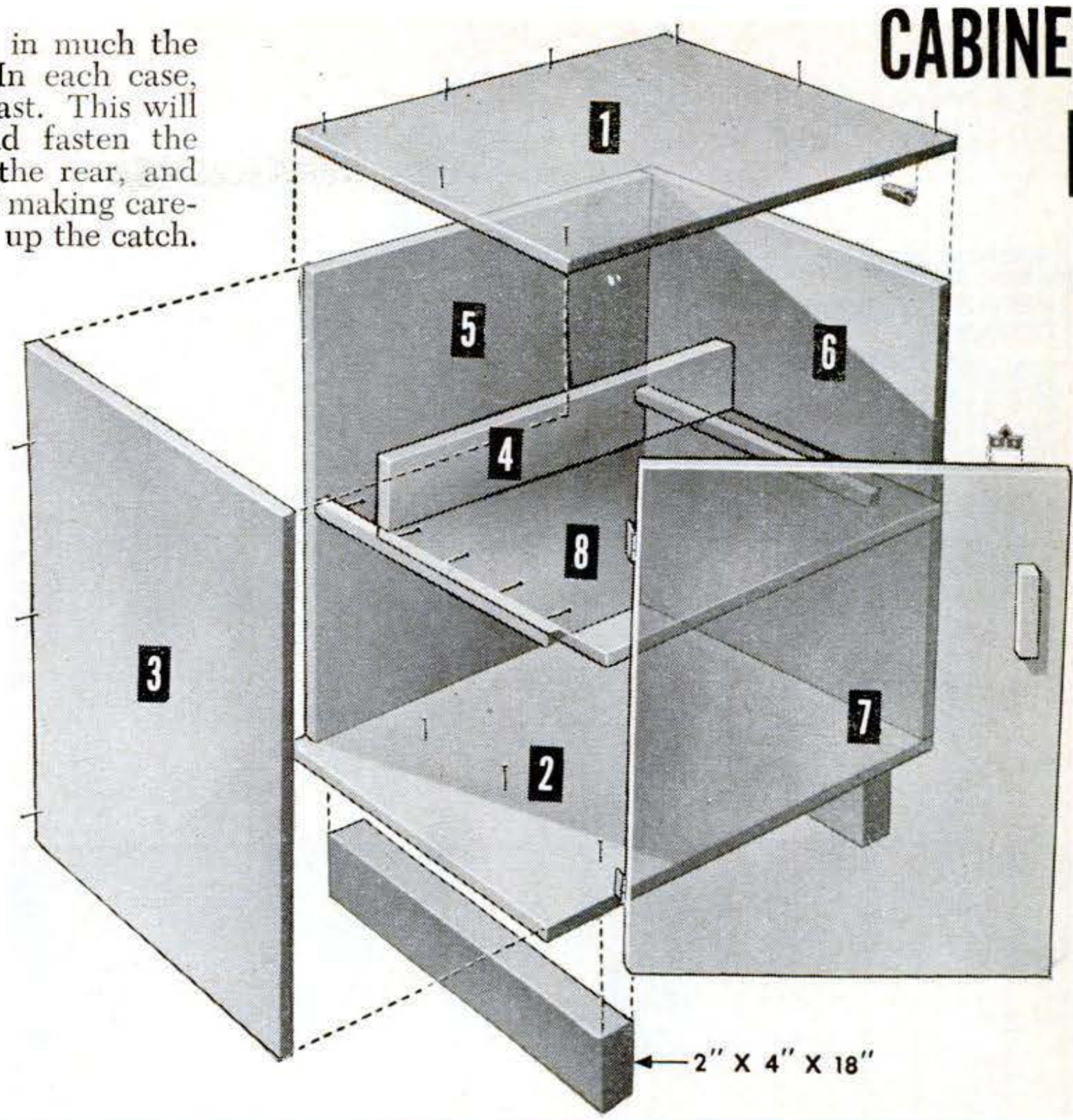
CABINET B

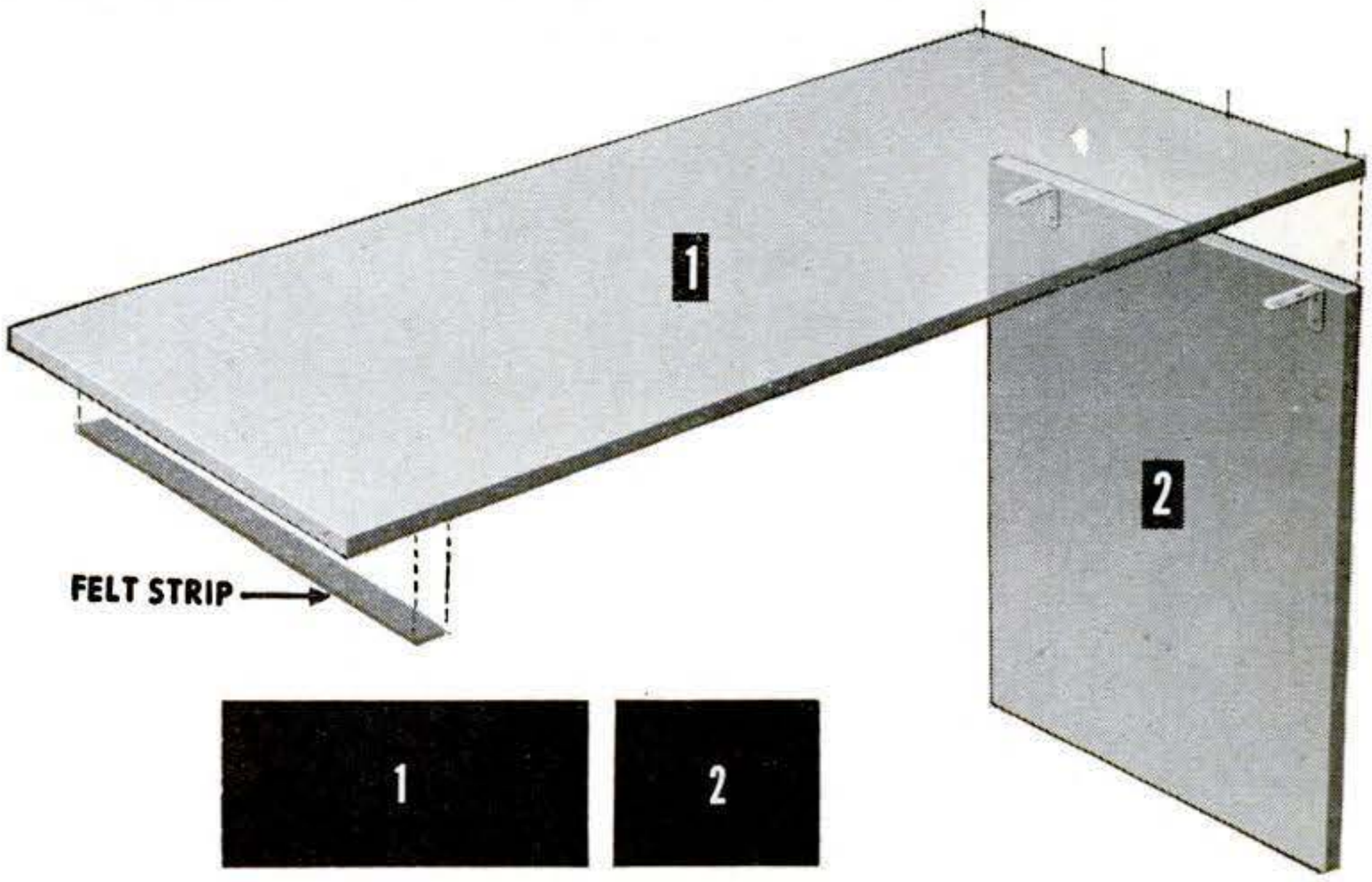
Cabinet B is assembled in much the same way as chest A. In each case, put the back into place last. This will allow you to locate and fasten the spring door catch from the rear, and eliminate the necessity of making careful measurements to line up the catch.





DESKTOP C

The desk top, which can be used with either the cabinet or the chest, is simply two pieces of plywood fastened together with nails and two 2-in. corner braces. To protect the top surface of the chest or cabinet, glue a strip of felt 1 in. wide to the underside of the desk top.



Here you'll find the field wide and the choices many. The only requirements in so far as your "Basic Furniture" is concerned are that it be sturdy, true, have a blade at least 7 inches in diameter and a sure-acting automatic blade guard. As for the electric motor, I would advise at least a ⅓-hp. one.

Then go to a lumber yard, or more than one if you can. (It's surprising how plywood prices can vary.) Don't just order your lumber by phone. Shop for it and hand-pick each panel yourself. Watch out particularly for surface blemishes, patches, and broken or bruised edges. Remember just about all the plywood you buy will be used, so there'll be no chance to scrap bad pieces. Then, if your room is under 18 or 20 feet long, pay extra to have the big 4- by 8-

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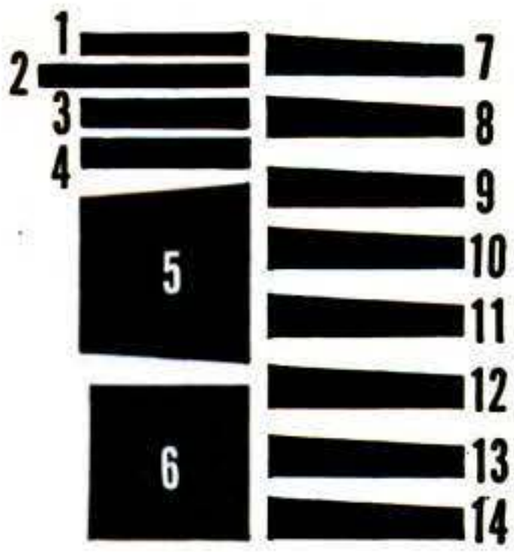
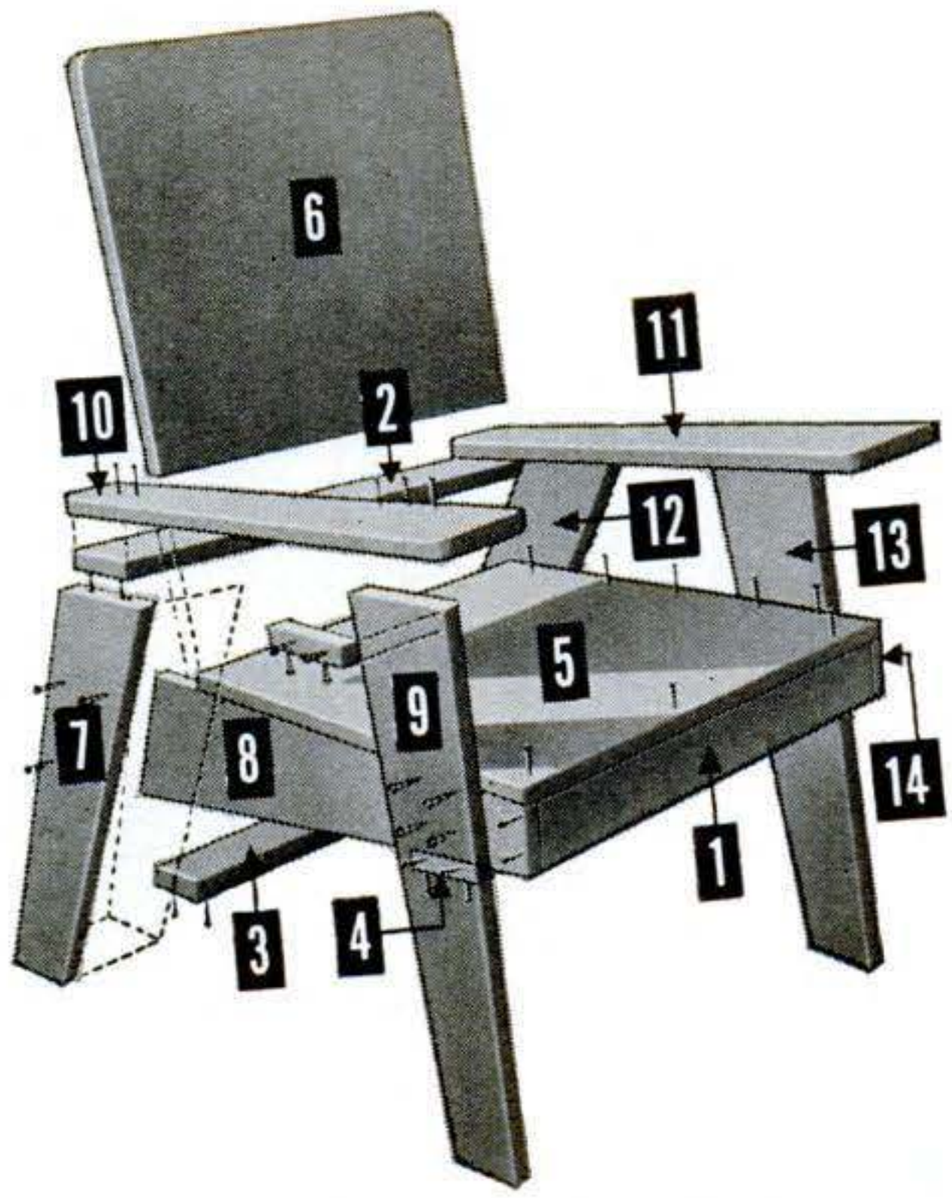
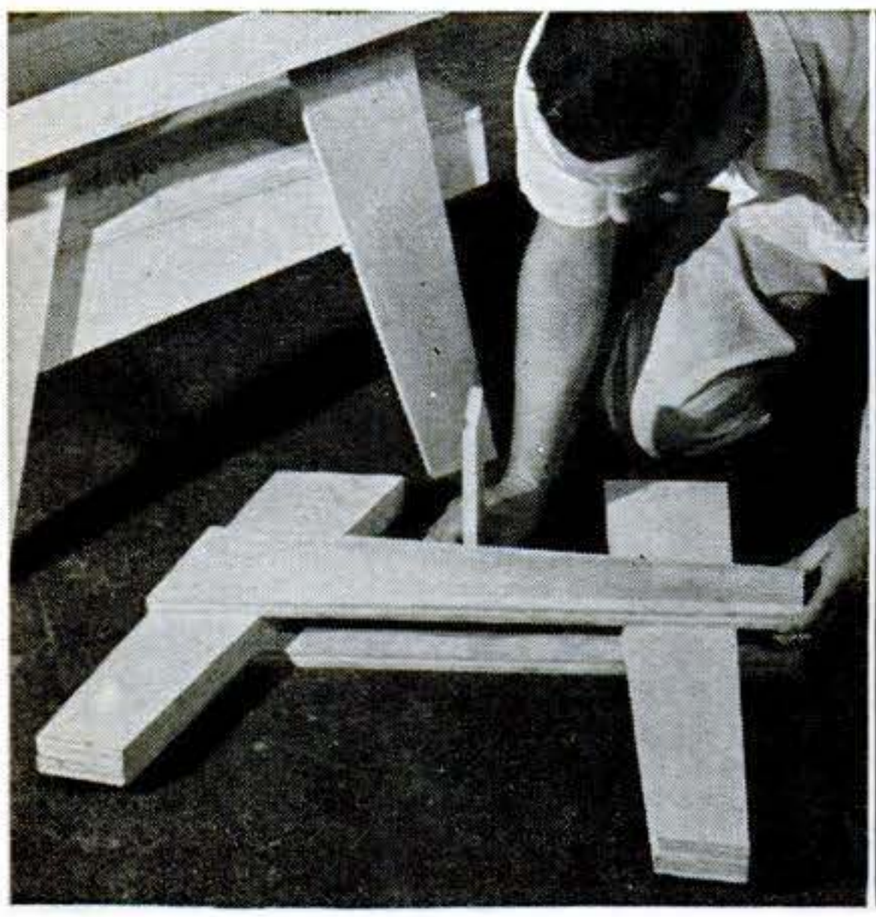
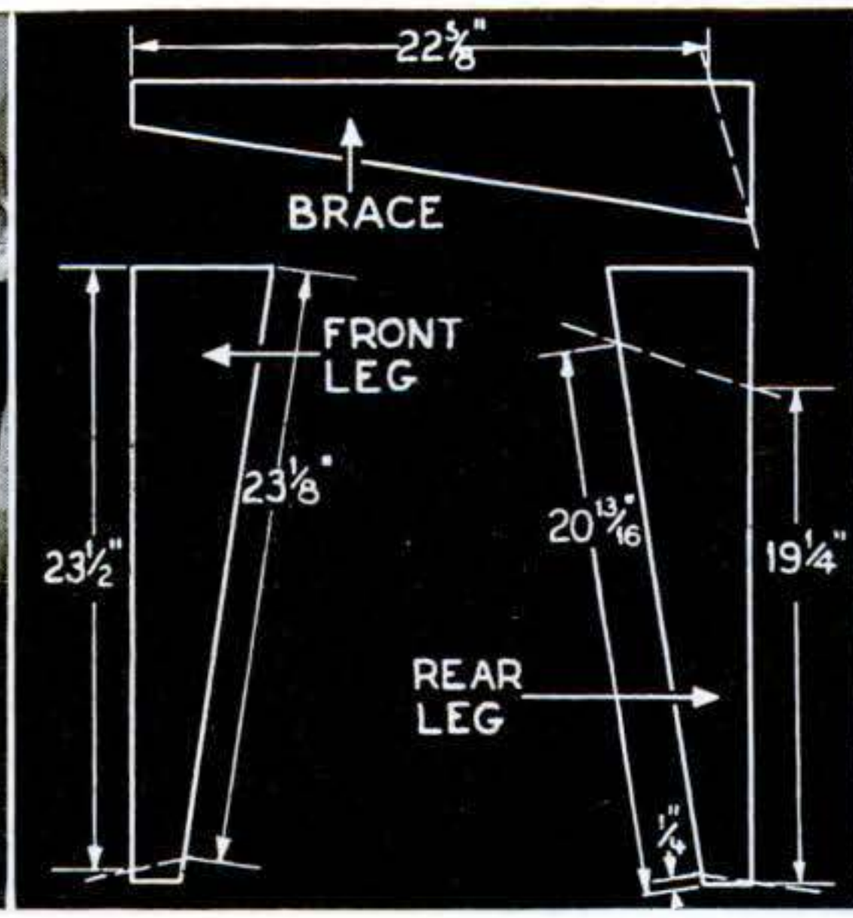
CHAIRS, D,E



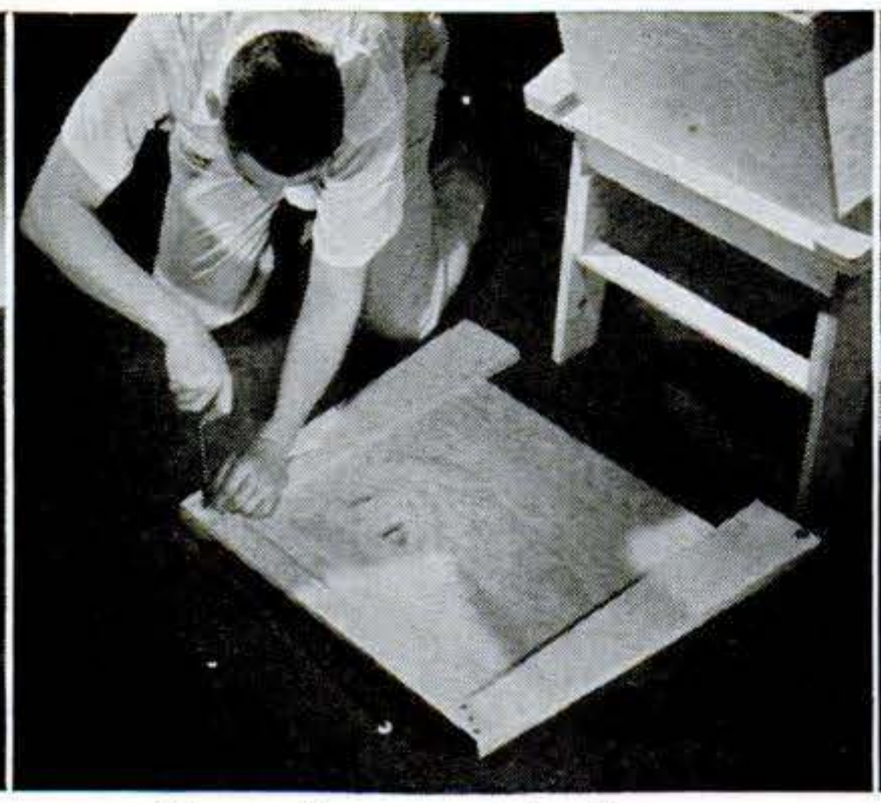


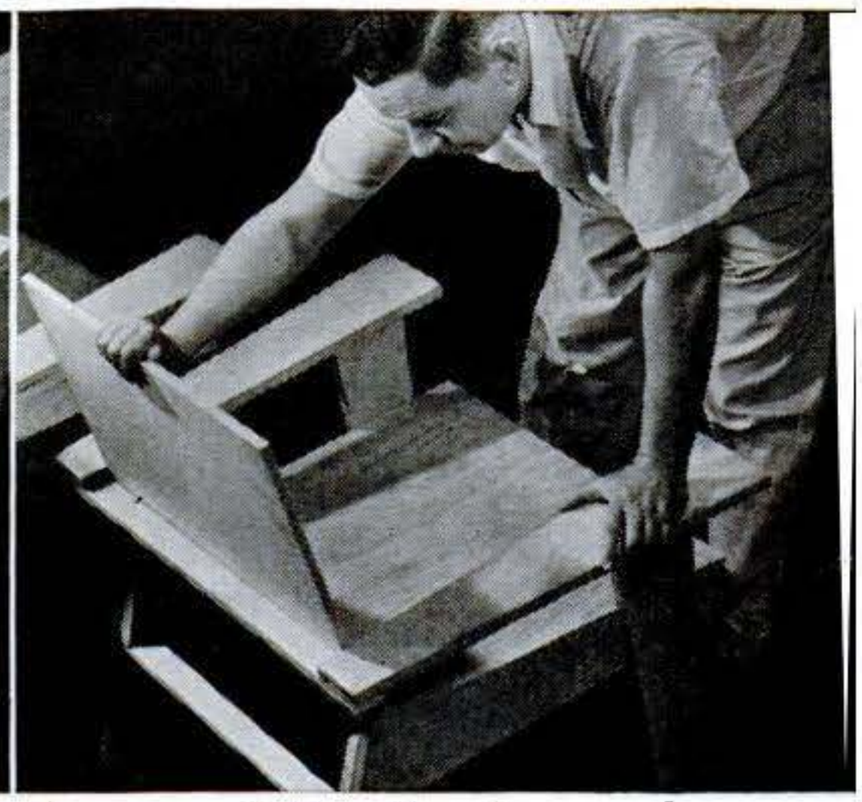
Except for the seats and the backs, the parts for chairs D and E come from the sides and ends of the plywood panels. It is these pieces—arms, legs, braces—that will have absorbed any minor errors you may have made in measuring for the major cuts. For this reason, if the dimensions don't exactly match those on the cutting layouts, don't worry about them. You'll still have two chairs in spite of slips. If all cuts were made in the sequence indicated, the main proportions of all matching components will be the same and they will fit together.





Before assembling the seat supports and legs make the cuts shown. Front edge of each support should be about 16 in. from floor, rear about 13 in. Put seat in place with nails, turn chair over, and nail braces into place, one in the front, one in the rear of chair (left below).





Use the back as a guide for assembling the arms and the back support (center). Use screws as fastenings. Finally, place the assembled arms and back support on the tops of the chair legs, put the back between the arms, adjust for a comfortable angle, and nail in place.

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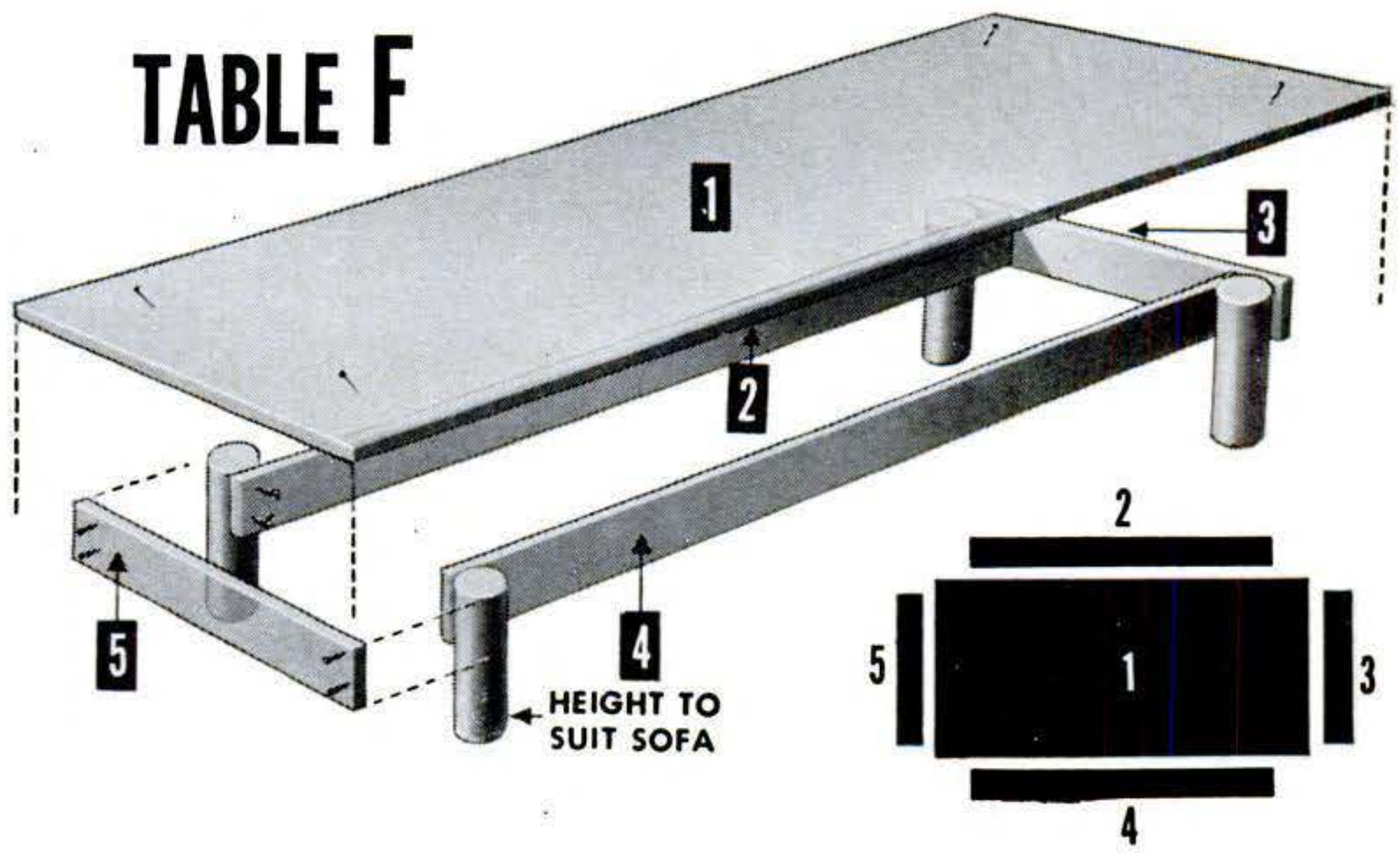
For the coffee table, you can use either of two types of legs. You can use lengths of the 2 by 4, or if you want to be fancy, you can use four dime-store rolling pins minus their handles. If you use rolling pins, subtract six feet from the amount of 2 by 4 that you order from your lumber dealer. Legs and under frame are assembled with screws, the top fastened down with nails.



foot panels cut in half. It will be worth it not to have to wrestle with big sheets.

The furniture shown was made of fir plywood—three panels (1, 2, and 3) ¾-inch thick; two panels (4 and 5) ½-inch thick. If you want still better quality and want to spend another forty bucks, you can use birch plywood instead of fir.

The real factory-method secret to the success of the whole project is the ingenious Grabe-designed floor jig. It makes it possible to cut oversize pieces easily on a small power saw. It consists of two 1- by 4-inch wood strips nailed to the floor to serve as rails along which the mounting board for the saw and its motor can slide, and a 1- by 1-inch batten nailed to the adjacent wall at saw-table height to serve as a support and cutting guide. The jig makes it a cinch to make wide cuts simply by varying the relative position of the saw and the wall.

Hold down the saw and motor base for each setup with four wood screws. There's just one simple precaution. When setting up for each new cut, make sure that the saw blade is exactly parallel to the wall and at the right distance from the wall. But even this is no problem. Simply place a long, straight board flush against the outer face of the saw blade in its fully raised position, clamping the board down with C clamps, if you have some. Then adjust the saw on the rails until the measured distance between the inner edge of the board at each end and the wall are the same and match the required dimensions for the cut. After you've fastened the saw base to the rails, check the dimension again to make sure you haven't shifted the saw while screwing it down.

When you start making your cuts, follow Grabe's carefully figured cutting plan *faithfully*. It is your assurance that any errors in making a cut or adjusting the saw won't show up in the finished furniture. Your errors, thanks to the engineered design, will simply be absorbed by the chair and table legs and other incidental parts.

Make all your cuts *in the sequence indicated*, and make all cuts for the *same dimension* with the *same setting* of the saw. Remember, you are making your furniture by factory-production methods. As you run the plywood through the saw, you are not cutting out a chair or a table, but standardized parts. To make it easier to identify the parts later on, roughly label each component on each of the five panels. Use the A, B, C code indicated on the panel diagrams.

After you've swept up the sawdust, you can start your home assembly line in motion. First, arrange your mass-produced parts in piles, one for each piece. Here's where your code letters come in handy.

You'll be surprised how easily the various pieces go together. You'll have no worries over complicated joints and difficult methods of fastening. Simple butt joints held together with nails or screws and a binding of strong plastic-resin glue provide a rigid construction that will take plenty of punishment. Nail and brad heads should be set—if you haven't a nail set, another nail can be used to force the head below the surface of the wood. Fill the holes with composi-

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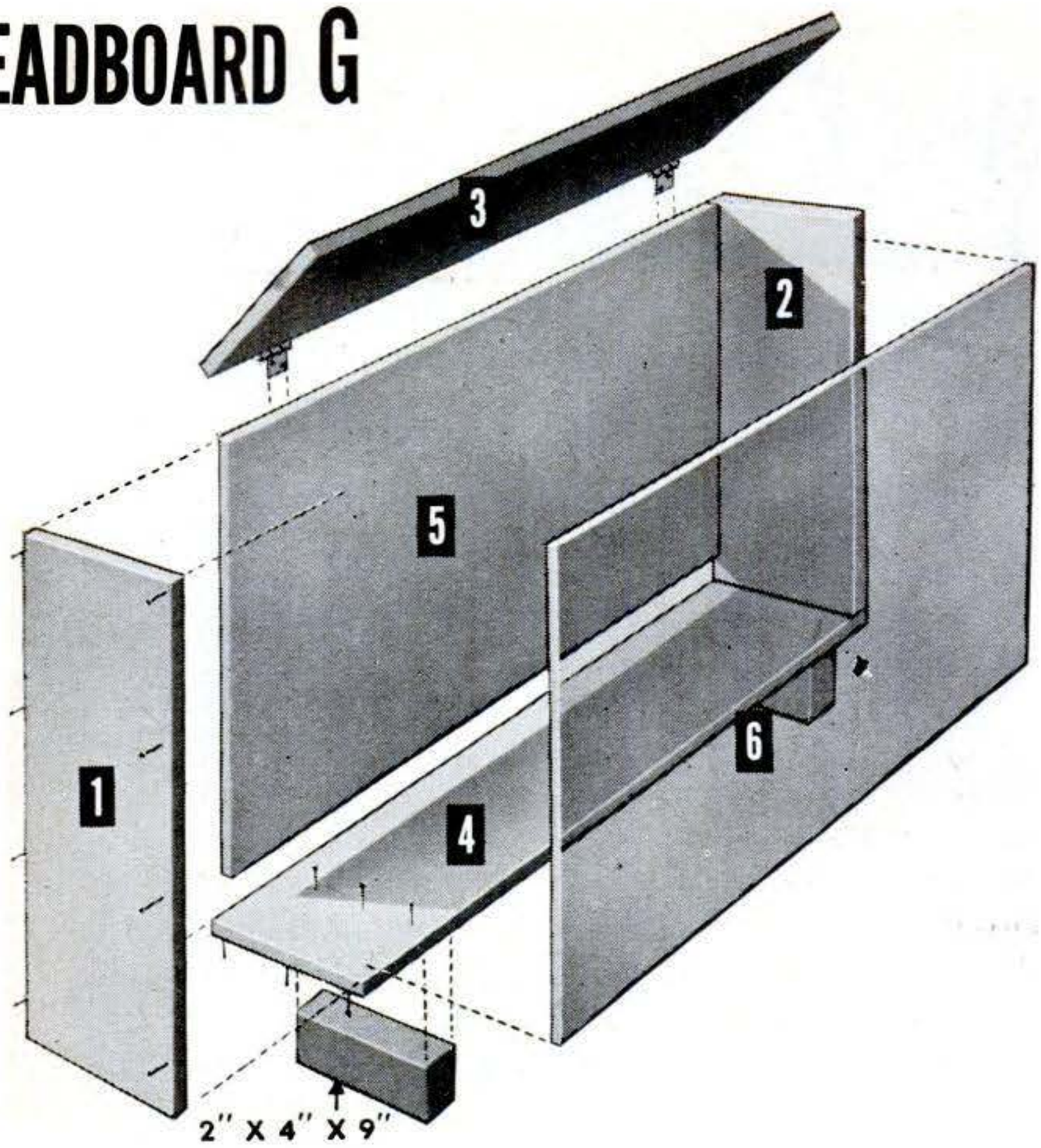
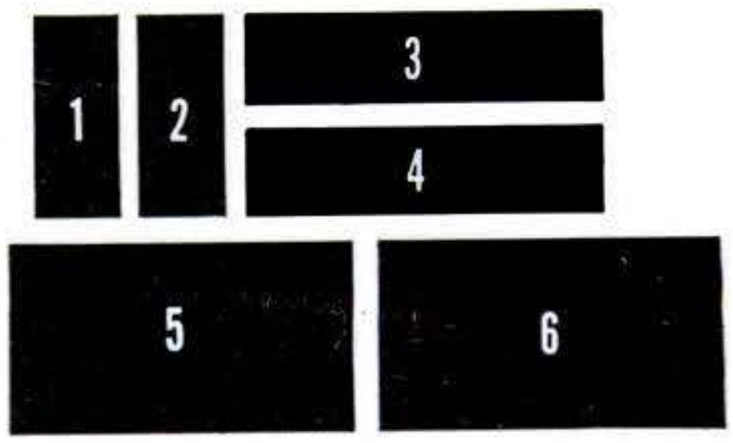
HEADBOARD G





The bed-clothes storage cabinet that doubles as a headboard for a Hollywood bed (mattress and box spring fitted with inexpensive screw-on legs) is easy to assemble. Except for the screws used to fasten the two 2- by 2-in. hinges in place, nails are used throughout. Note that the back panel is so placed as to provide an opening at the bottom and the front panel provides spaces at the top and the bottom. These openings allow for an adequate circulation of air. Two pieces of 2 by 4 make legs.

tion wood filler. Since the handful of screws used are in places where they won't show, there's no need even to countersink them.

When your "Basic Furniture" is all built, sit in the chairs, test the tables—they won't wobble. Then tell yourself that you've manufactured a couple of hundred dollars worth of darned good furniture.

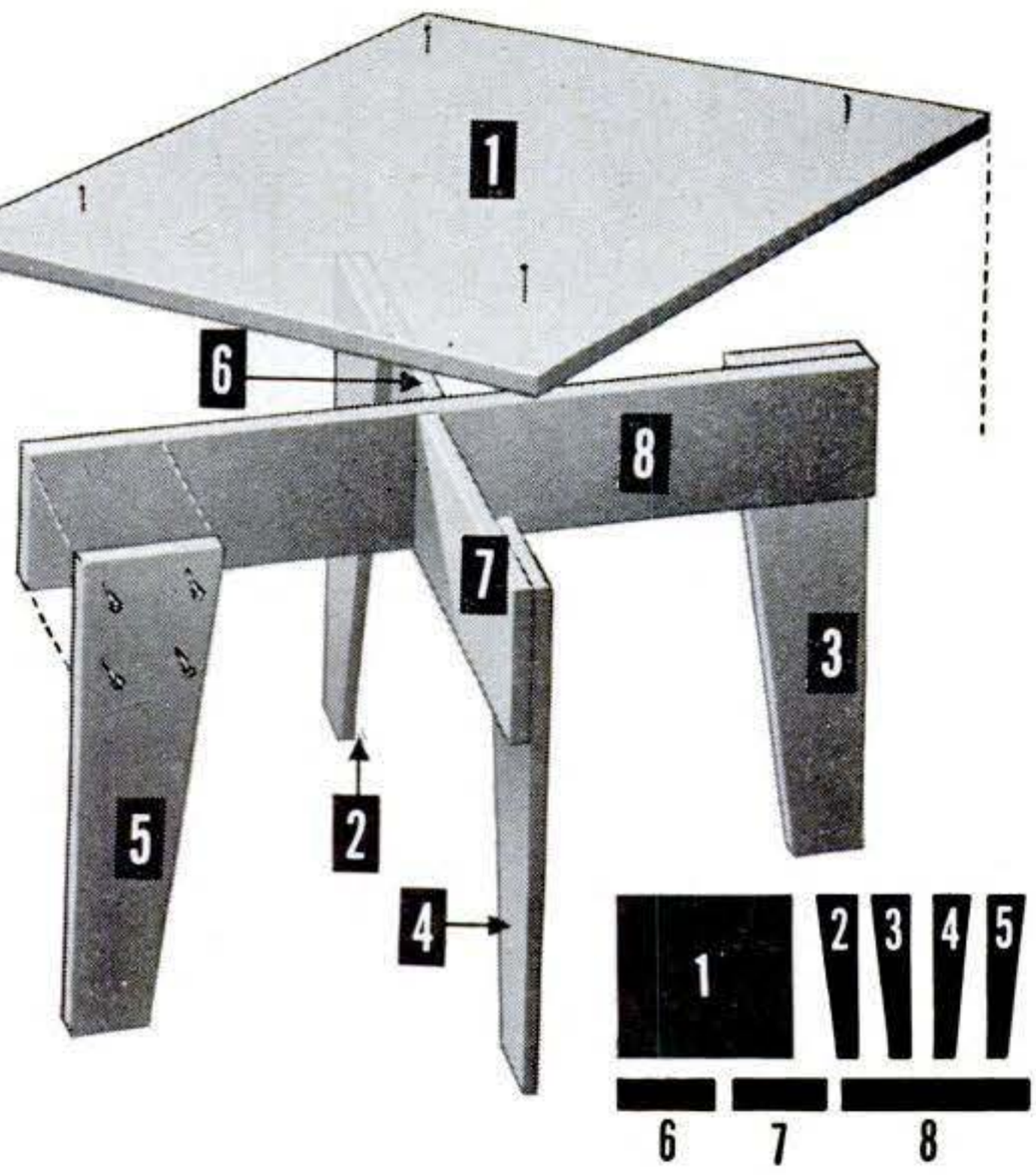
But remind yourself that handsome is as handsome *looks* as well as does. What you do about finishing your furniture will make the difference between "adequate" and "how wonderful." So take a breather, turn to page 185, and don't spare the sandpaper.

I watched every stick of this nine-piece set of furniture illustrated on these pages as it was cut, assembled, and finished. It was designed and planned by an expert, but it was produced as you see it—NOT in a factory, not even in a home workshop, but *right in the* POPULAR SCIENCE *editorial rooms*—by amateurs. END

FULL-SIZE *patterns for the chair, plus a reprint of this article, can be had by sending 75 cents to Klaus Grabe, 132 Front St., New York 5, N. Y.*

TABLE H

The occasional table actually wasn't in Klaus Grabe's initial planning, but when he completed his cutting plans, there it was. It fits together easily with nails, and is designed to be just the right height when used next to one of the chairs.



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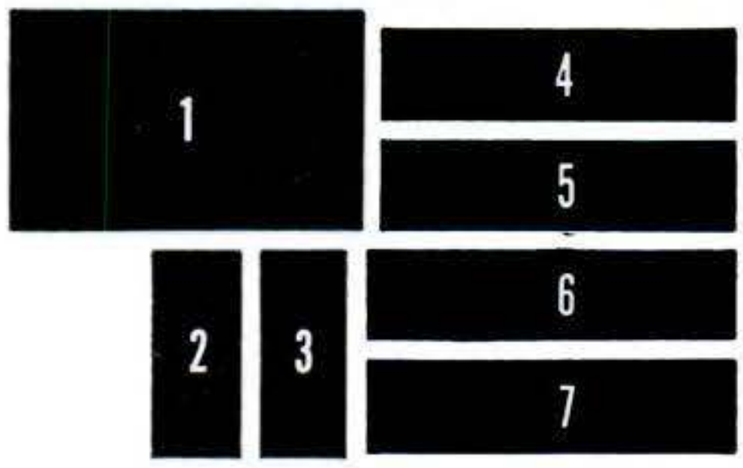
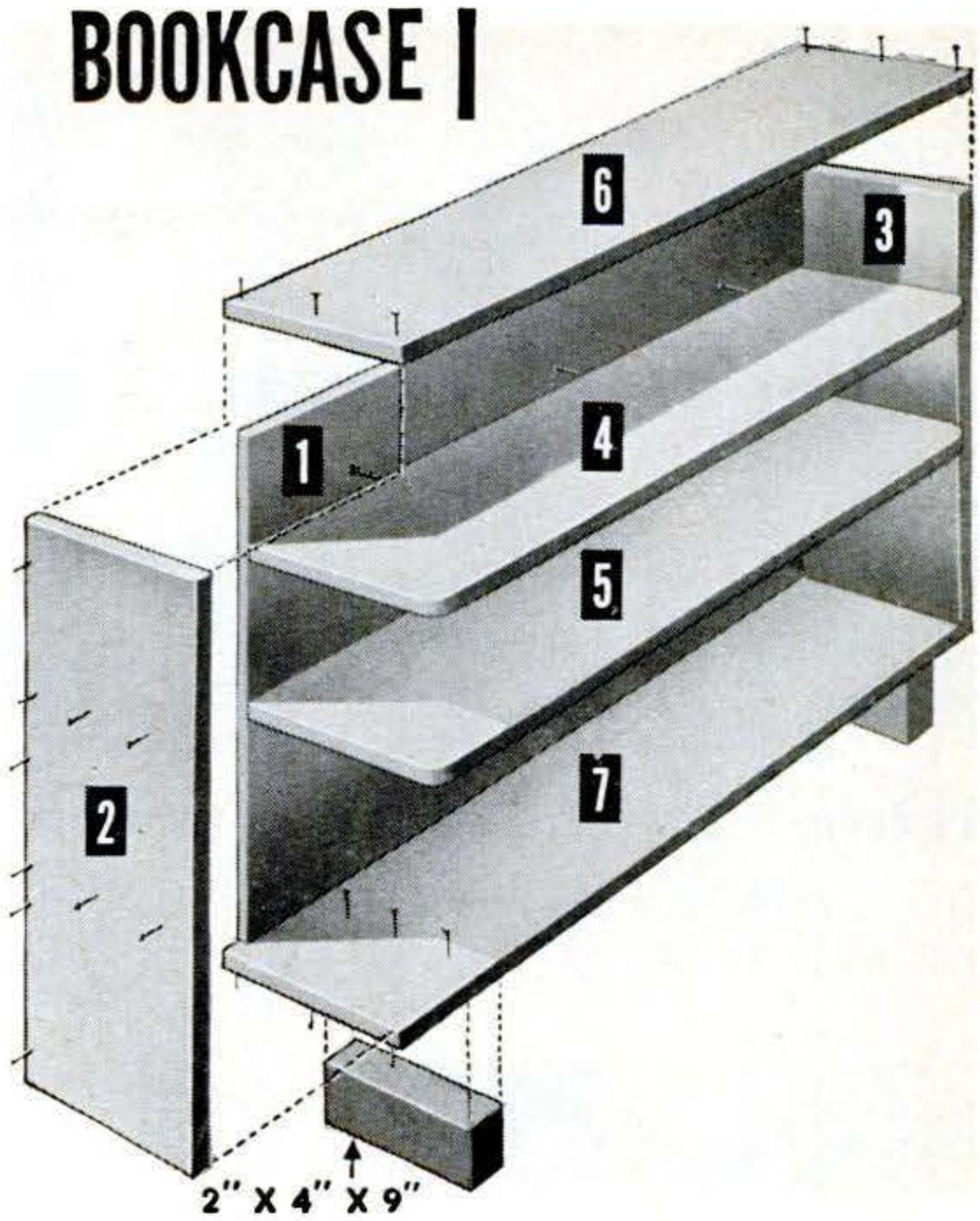


BOOKCASE I



When you put together the bookcase, which doubles as a footboard for the Hollywood bed, you've only nails to worry about, unless you want adjustable shelves instead of the permanently nailed-in variety shown in the drawing. For adjustable shelves, all you have to do is drill two rows of holes up the inside of each end piece and add eight push-in shelf supports to your hardware list. To conform with the headboard, two sections of 2 by 4 serve as legs. They are nailed on from inside.

Meet the Designer

KLAUS GRABE has a unique background, and it was that background that prompted PS's editors to choose him as the designer of "Basic Furniture." A craftsman-designer, Grabe's main aim in life always has been to provide functional furniture at prices that the average person can afford. One of his first attempts at inexpensive furniture design won him the Museum of Modern Art Pan-American Award. He also helped to produce the unusual furnishing for Cincinnati's Terrace Plaza Hotel (PS, Feb. '49, p. 166.) His low-cost knockdown furniture kits, like the one shown at the right, have won him recognition in a score of national magazines, including *Life*.

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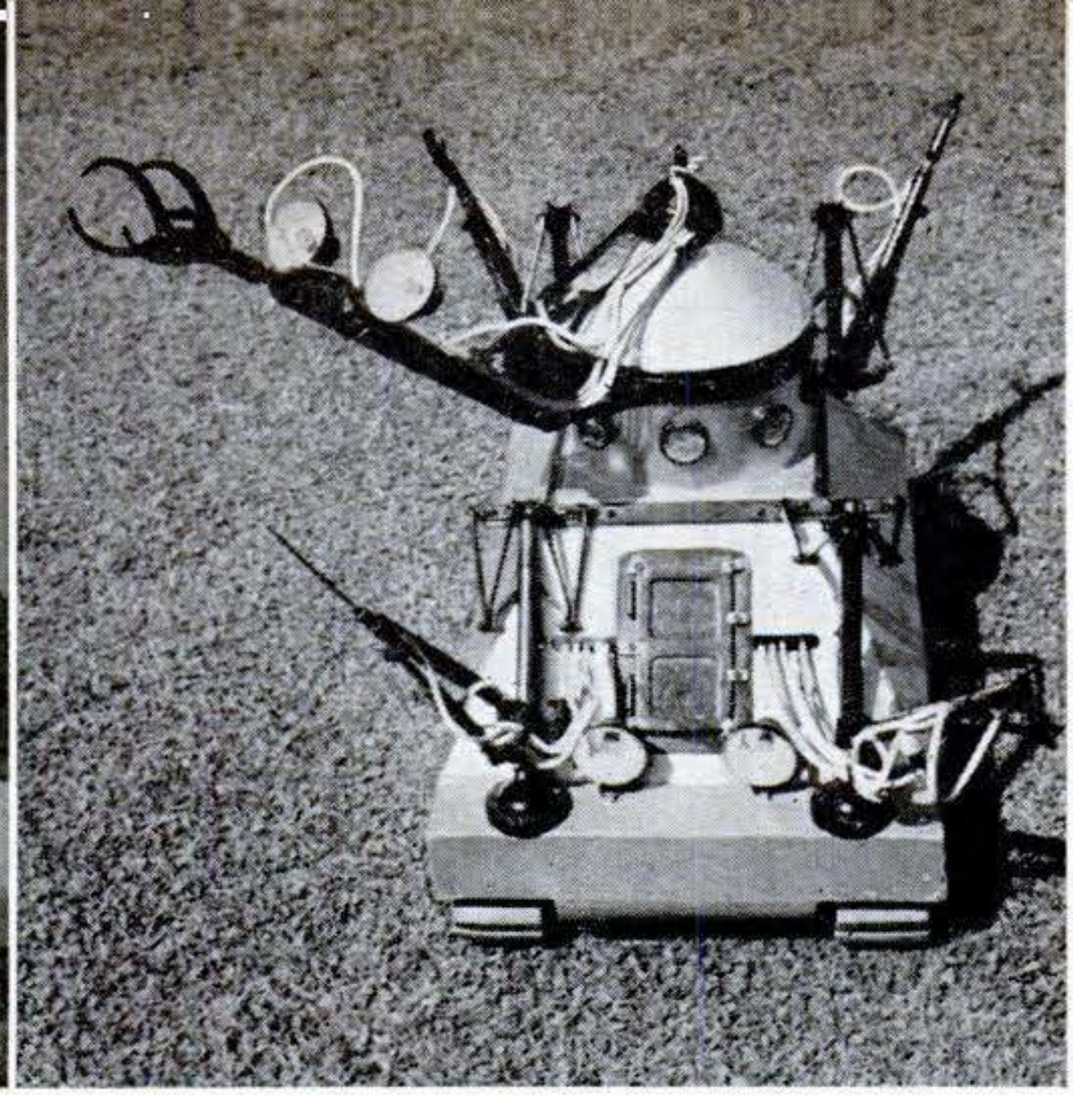
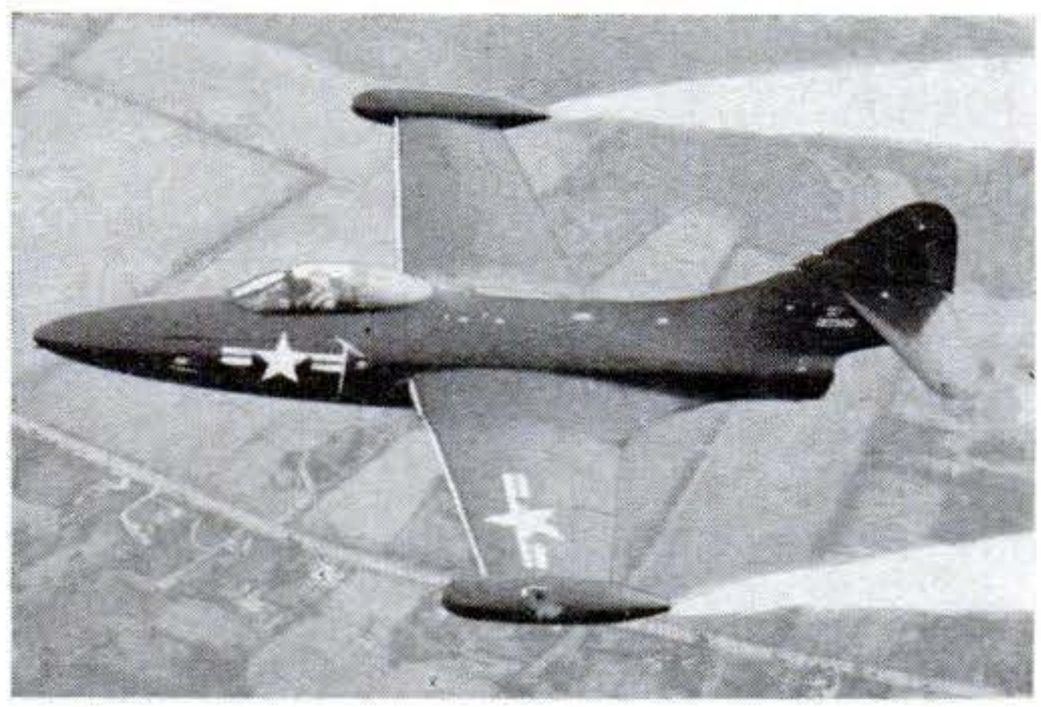


Diving "Tank" to Roam the Ocean Bottom

THIS tanklike, claw-armed mechanical monster, shown above in model form, will play grab bag in Davy Jones's locker. Designed to retrieve undersea treasures and do ocean-bottom odd jobs, the full-scale version will weigh 25 tons and carry three operators. A caterpillar tread, electrically powered, will give it mobility. Five hydraulically operated arms will perform a variety of jobs, depending on the type of "hands" or tools attached, such as picking up objects, drilling steel plates, and even tieing knots. Explorer Harry E. Rieseberg, designer of the monster, hopes to go down 2,000 feet and take movies of undersea operations.

Luxury for Truck Drivers

TRUCK pilots get more room and new comforts in this driver's cab in General Motor's new "H" models. The driver's seat can be moved four inches forward or back, and increased leg room provides ample space for the rangiest of truckmen. The cab itself is a full foot and a half wider, and the single passenger seat shown above can be replaced by a wide, two-passenger seat. Windows and windshields are wider, higher, and give 50 percent more vision. A built-in, forced-air ventilation system adds all-weather comfort.



Jet Fighter Jettisons Fuel

MOST fast fighters drop their wing-tip fuel tanks when they suddenly need additional speed or maneuverability. But this Navy F9F-3 Grumman Panther just releases the fuel. The two tanks, fitted snugly against the wing tips to minimize drag, are non-droppable. But it takes only 40 seconds to empty both. Danger of fire is eliminated because the plane flies so fast that even if the fuel ignited it would be quickly left behind.

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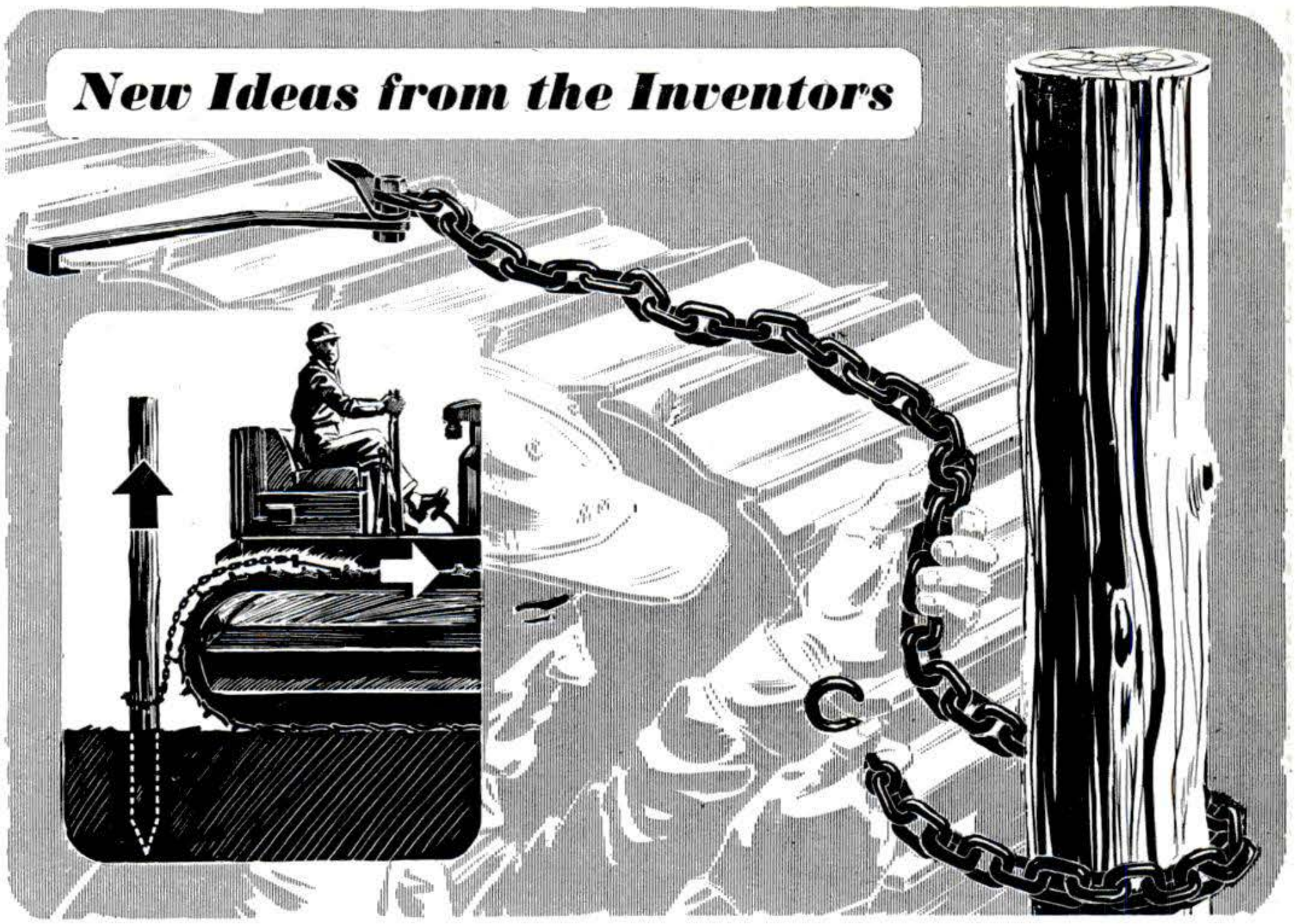
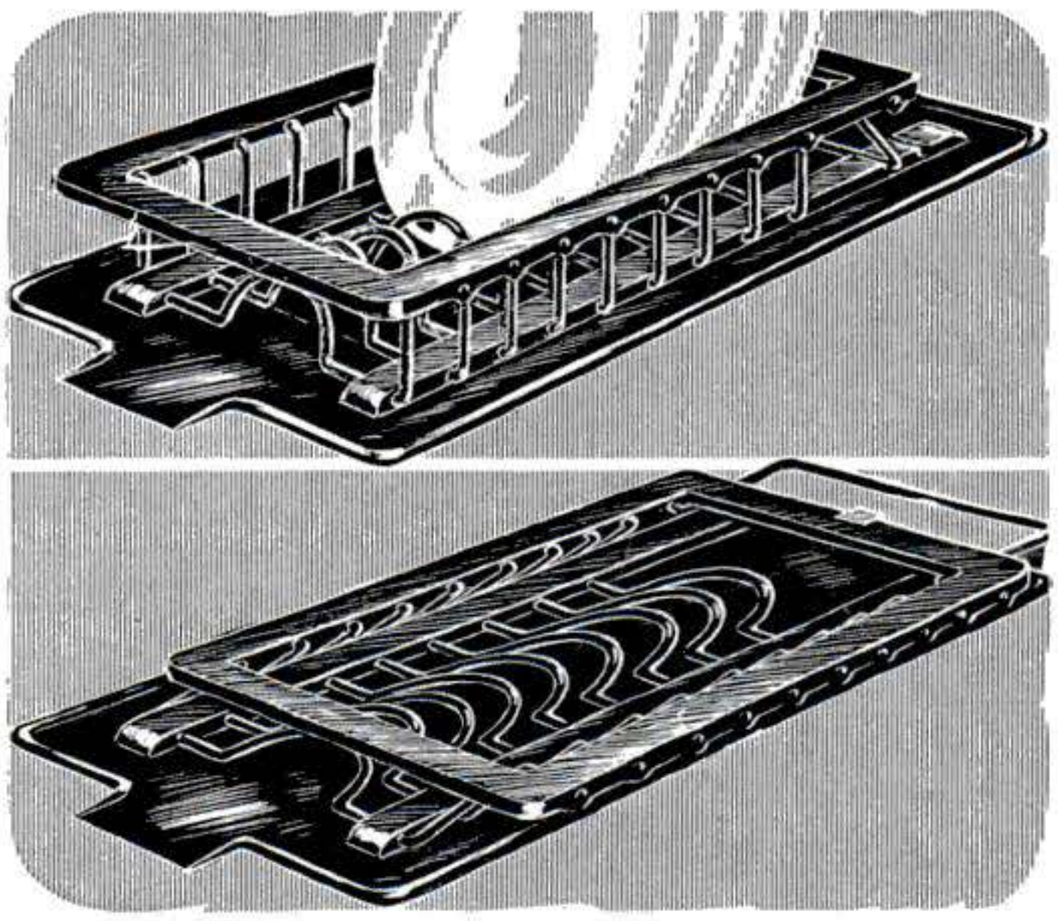
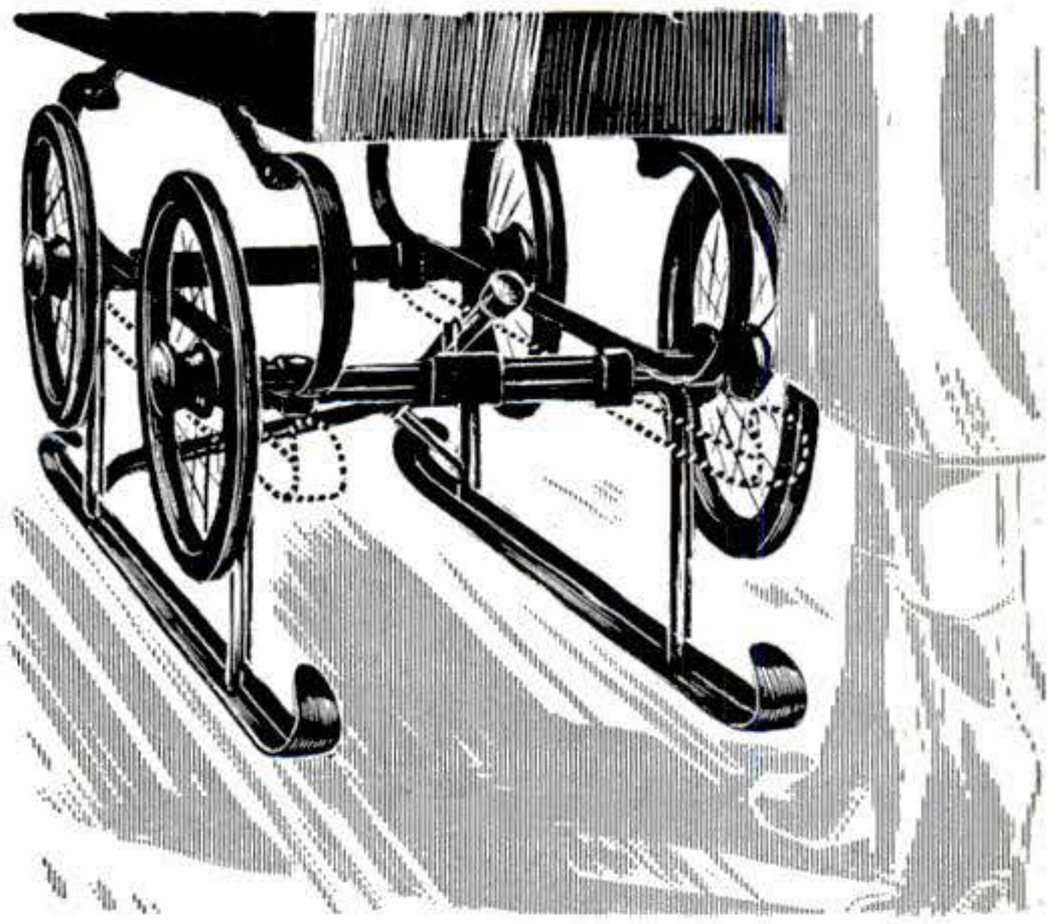
New Ideas from the Inventors



1 Post Puller to Fit Tractor. With this simple attachment, it would be easy to pull posts with a tractor. The puller consists of an adjustable track grip, a length of chain, and a hook. In use, the two jaws of the grip are placed over the two edges of the track and the chain is hooked around the post to be pulled. When the tractor is driven forward, the top of the track moves forward and pulls out the post.



2 Dish Rack to Fold. The problem of storing a dish rack would be eliminated with this tricky one. When not in use, it can be folded flat and tucked away as easily as a tray. A hinged wire support at the end of the rack top fits into a recess to hold the rack open. A spring clip holds the top down when folded.



3 Pram to Go in Snow. A baby carriage could be maneuvered easily in snow or on ice when fitted with these retracting sled runners. Mounted on the wheel axles, they can be lowered into place or retracted by operating a convenient hand lever. In either position they are locked firmly in place.

Turn Page for More New Ideas

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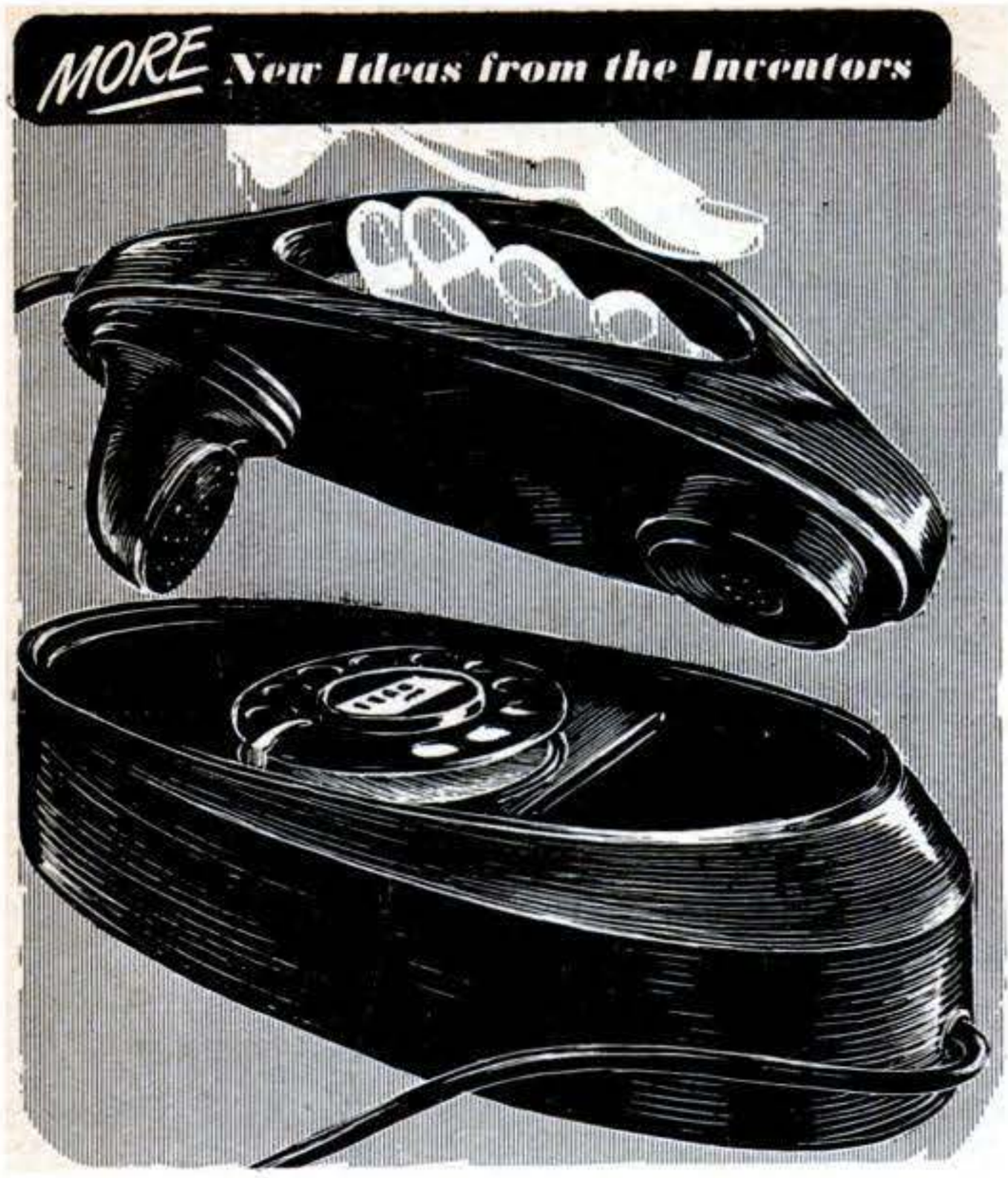
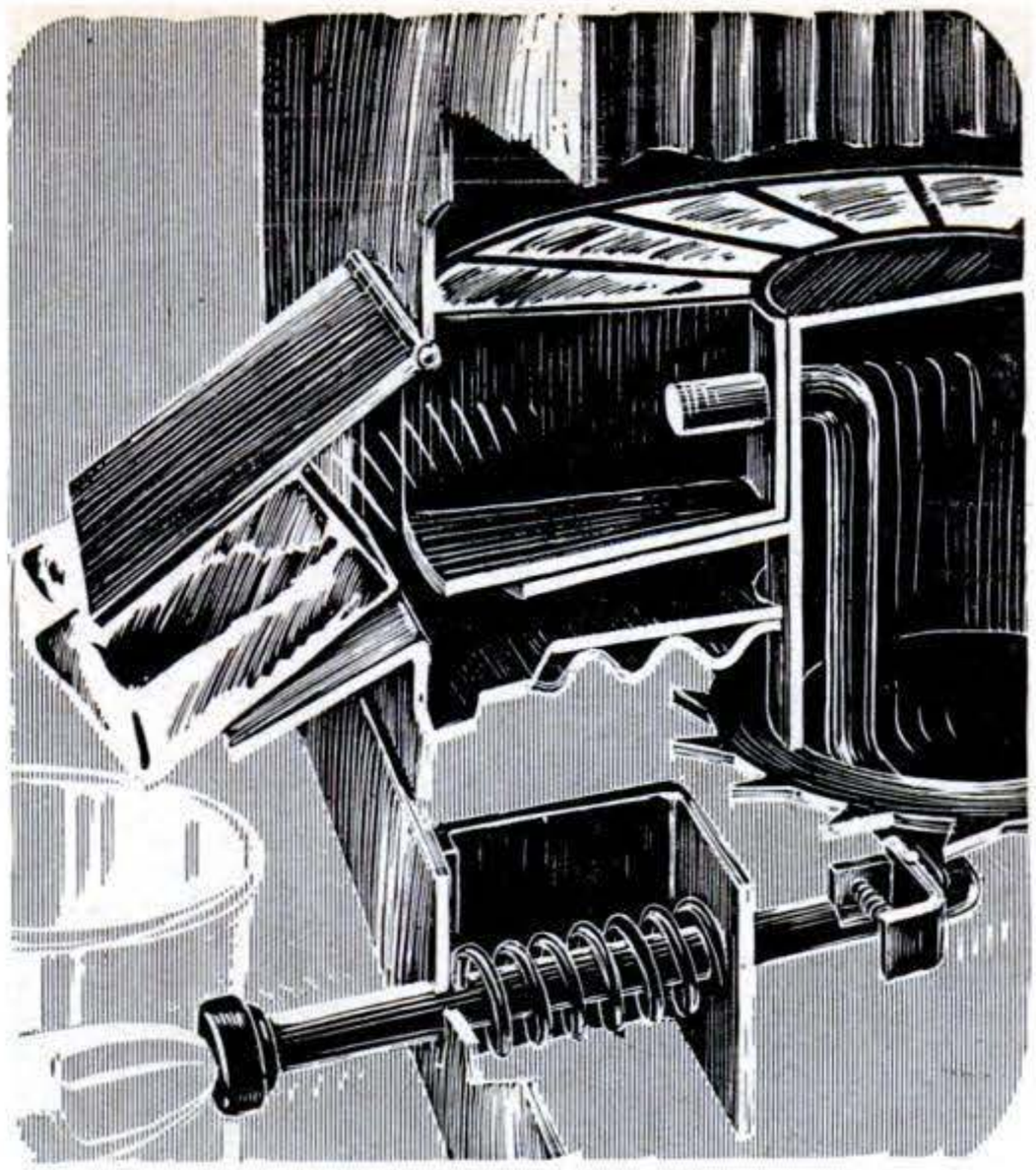
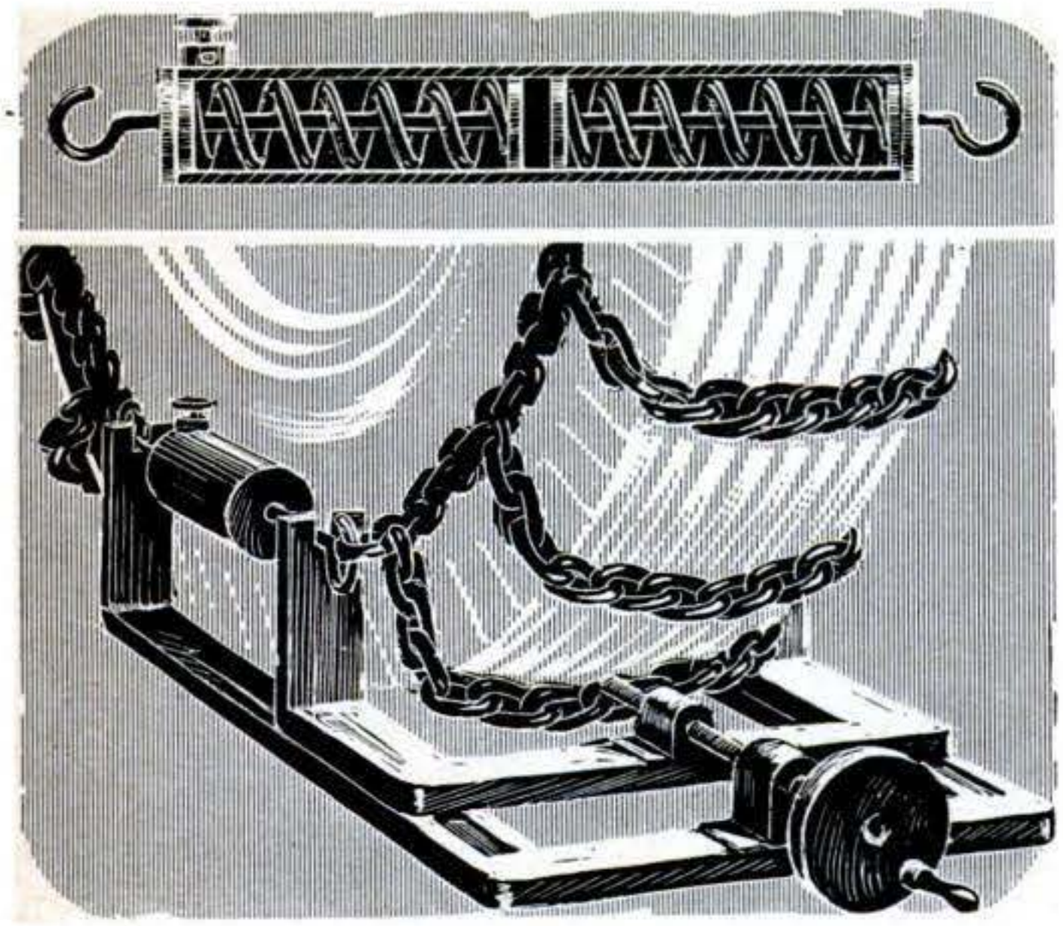
MORE New Ideas from the Inventors



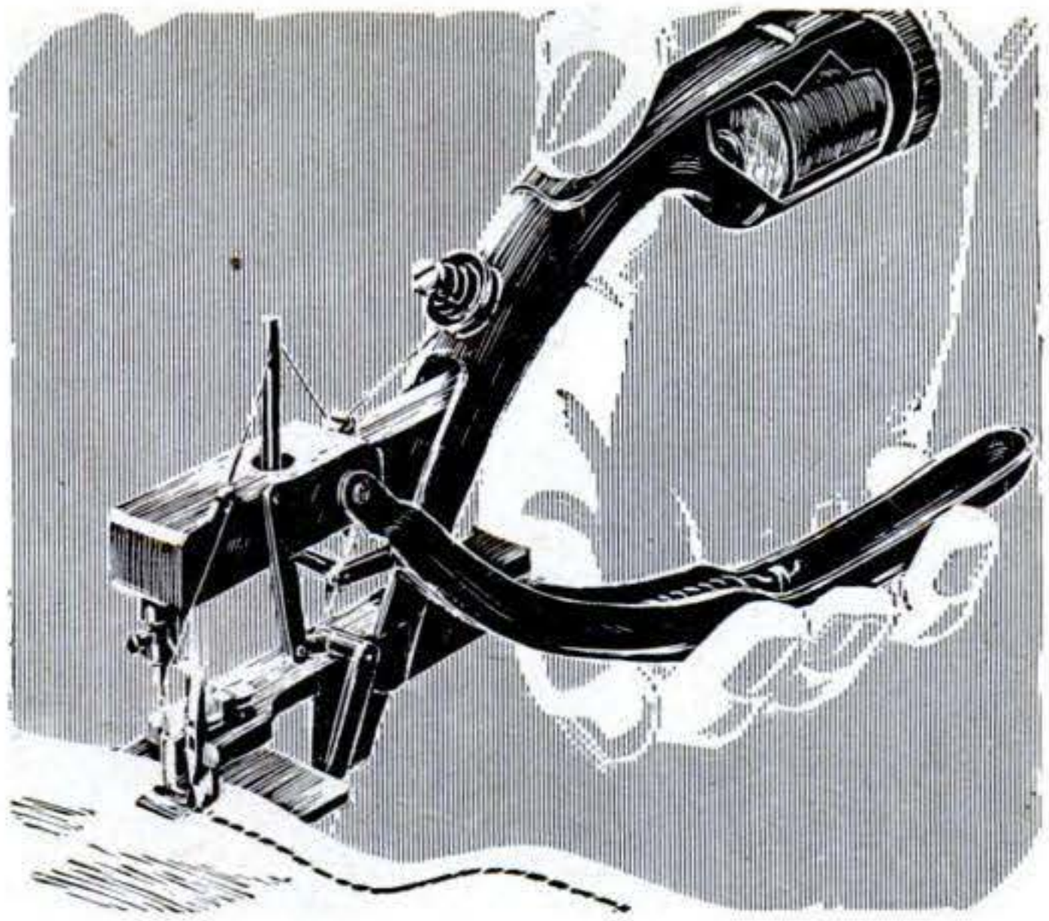
4 Phone to Save Space. The handset of this streamlined telephone forms a cover for the base when it is in place. Fitting into holes at each side of the dial, the receiver and microphone are protected from dirt and dust. When desired, the handset can be locked in place so that the entire phone can be lifted by the handle.



5 Ice Cubes to Pop Out. No need to wrestle ice cubes from this refrigerator compartment. Simply push a button and out pops one cube. Circular sectional trays filled with water are first frozen in the upper part of the compartment, then transferred to the ejection rack in the lower part. As the cubes are ejected, the tray revolves.



6 Springs to Hook Chains. With this fastener you could put on skid chains without jacking up the wheel or driving over them. Once the hooks are extended by cranking them apart with a screw shaft, trapped air holds them out to catch dangling chain ends. A valve releases the pressure and lets the springs draw the chains tight.



7 Stitcher to Fit Hand. This sewing machine works like a ticket puncher or a pair of pliers. Squeezing the two hand grips together operates the needle and the thread and material feeds. The stitcher is designed for use on small sewing jobs and in places that would be hard to get at with a hand-held needle or a large sewing machine.

Patents on these inventions have been granted to: 1. H. W. Lassila, Great Falls, Mont.; 2. E. H. Jenness, Shaker Heights, Ohio; 3. G. F. Nurenberg, Trenton, and J. Campbell, Florence, N. J.; 4. G. T. Baker, Liverpool, England; 5. D. L. Wallace, Saginaw, Mich.; 6. J. D. Carroll, McKeesport, Pa.; 7. D. A. Merson, Great Neck, and I. J. Moritt, Brooklyn, N. Y.

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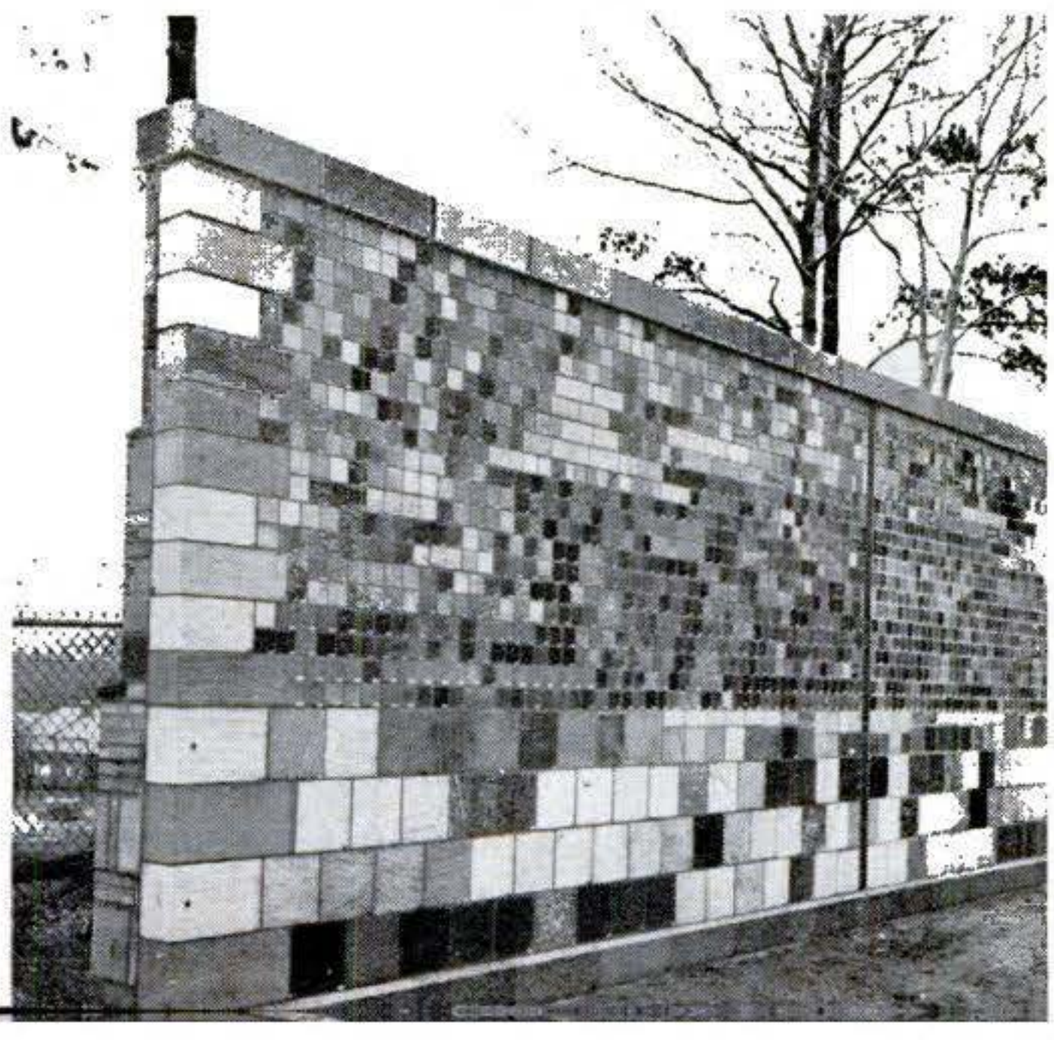
Three Jets Power New Bomber

THE power plant, T-shaped tail, tandem landing gear, and thin high-speed wings with a 35-degree sweepback make the Martin XB-51 ground support bomber an unusual addition to the Air Force. It is the first Air Force plane to be powered by three turbojet engines. Two are mounted on pylons on the lower sides of the fuselage; the third is inside the rear of the fuselage.

Also unique are the variable-incidence wings, which droop when the plane is on the ground, become straight in flight. Armament is an interchangeable arrangement of eight 20-mm. or four 75-mm. cannon in the nose. A bay between the landing-gear units can hold 12,000 lb. of bombs. The pilot sits in the bubble canopy, while his navigator-radio operator sits inside the fuselage.

Wall Tests Stone's Wear

How long will a stone wall last? To find out, scientists at the National Bureau of Standards built this experimental model. It contains more than 2,000 specimens of stone from 47 states and 16 countries. It is expected to tell much about masonry weathering.



Big Lift Flexes Muscles

THIS trailer-load of automobiles is just a breeze for the world's most powerful lift. It can handle 110,000 lb., and this test load weighs only 30,000 lb. Automatic Transportation Co. built the lift for Oldsmobile, where it will juggle huge dies.

Diesels Make Train Without A Locomotive

Used singly or in trains, these versatile, self-powered rail cars promise greater luxury at lower cost.

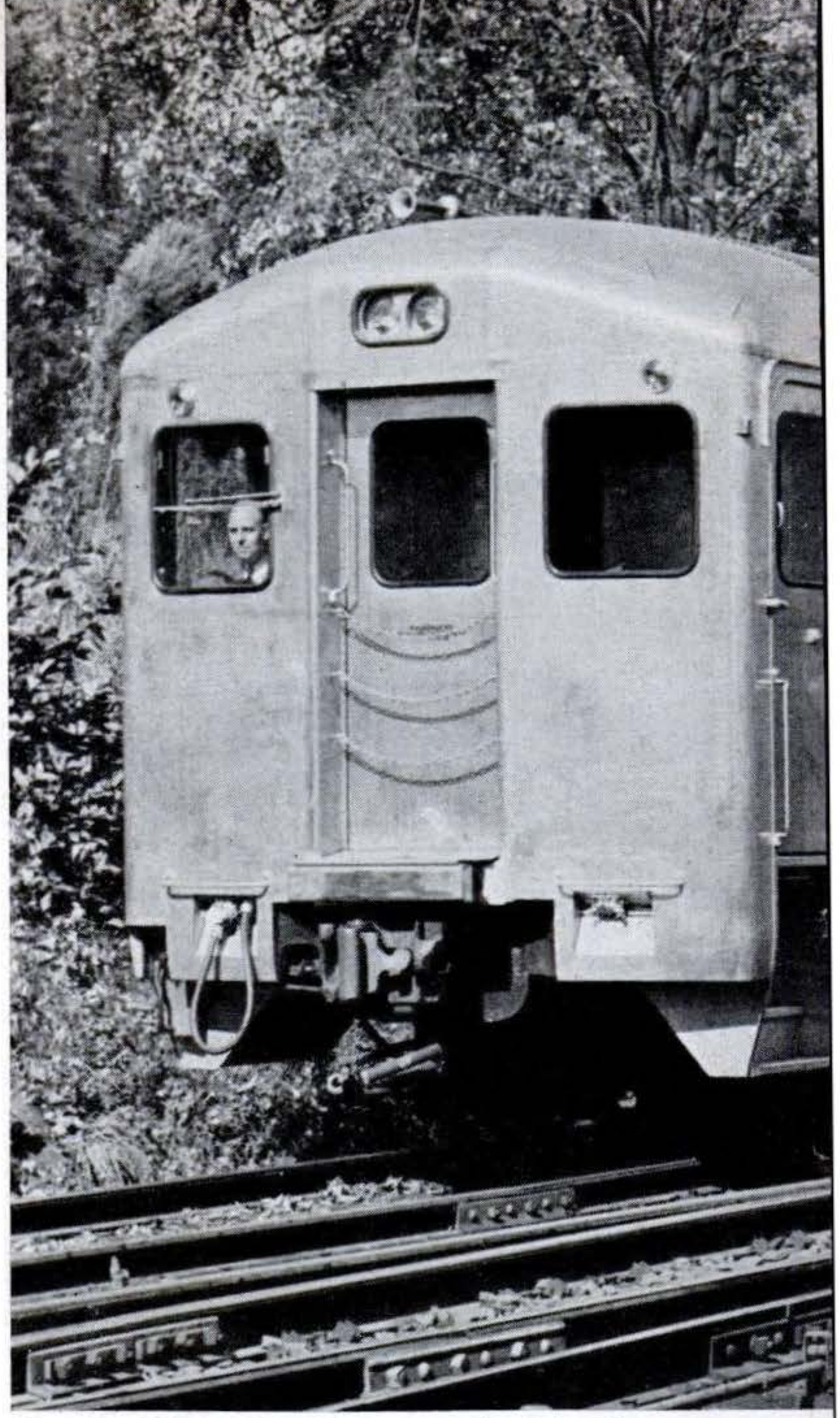
By Alden P. Armagnac

PS photos by W. W. Morris

DIESEL trains without locomotives are made practical by a new silver-white, all-stainless-steel rail car, the *RDC-1*. Introduced by the Budd Company, of Philadelphia, it is now making a series of demonstration runs on U. S. railways.

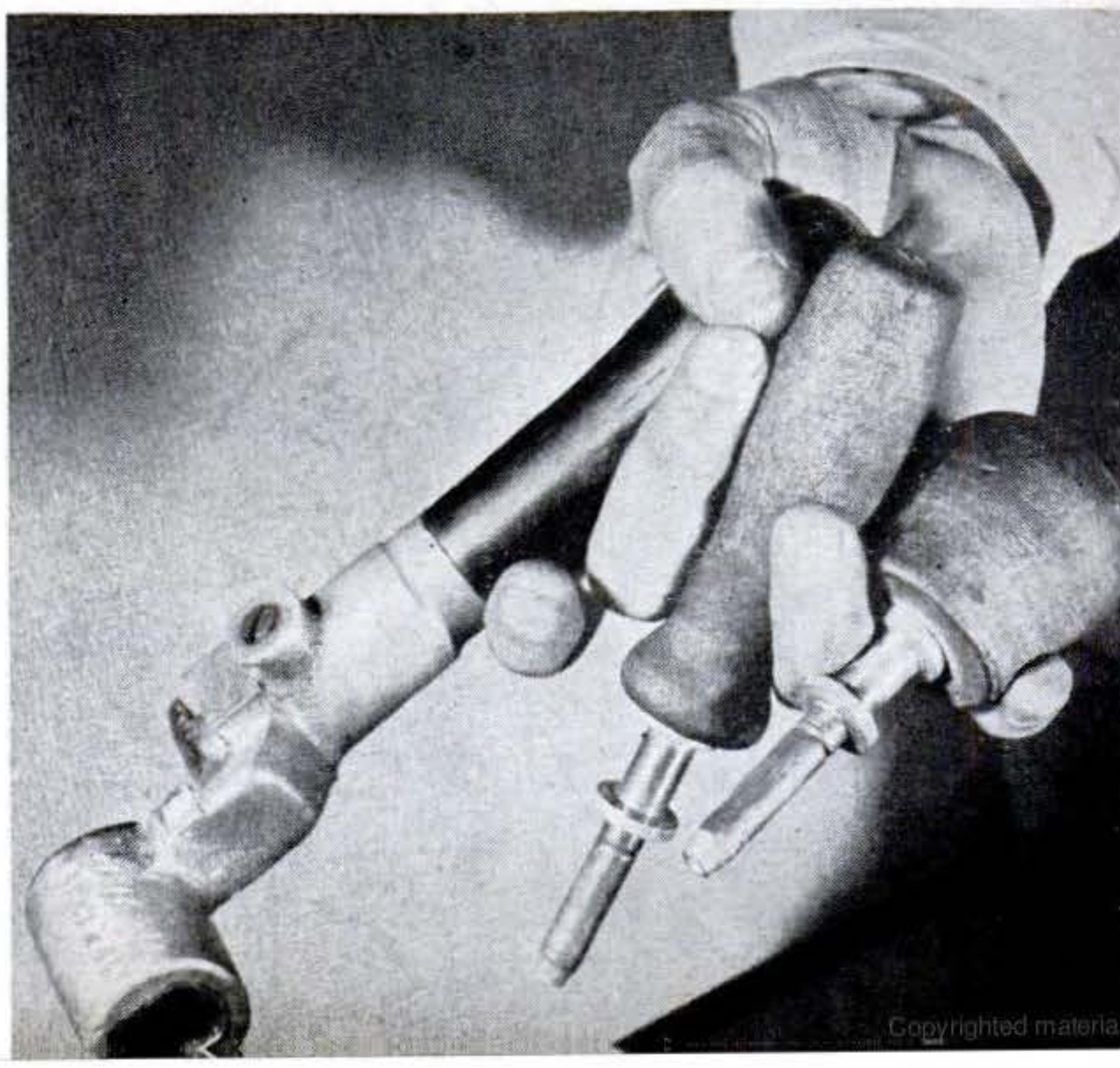
The new self-propelled Diesel cars can be coupled together like subway cars to form trains of different seating capacities to meet the changing demands of passenger traffic flexibly and economically. Long "engineless trains," for example, would serve commuters in rush hours. Shorter trains, or single cars, would offer passengers the same high-speed and comfortable service at hours when traffic was light. Both branch and main lines are foreseen as users of the new Diesel cars.

Seating 90 passengers, an *RDC-1* has a top speed of 83 miles an hour. Its engineman may drive it from either of two vestibule cabs with duplicate controls, one at each end of the 85-foot car. At the conclusion of a single-car run, he has only to carry his control handles from one cab to the other to start back again, making a turntable unnecessary. When several cars are coupled together, each one's power helps propel the train, but one engineman in a cab at either end of the train controls them all. Electrically linked solenoids and controls insure that each car has exactly synchronized directional and power settings.



New Budd car, *RDC-1*, gets rail trial. Up to

After completing run, engineman simply carries these control handles to cab at opposite end of new car to start back again. Duplicate cabs at the two ends eliminate need for turntable.



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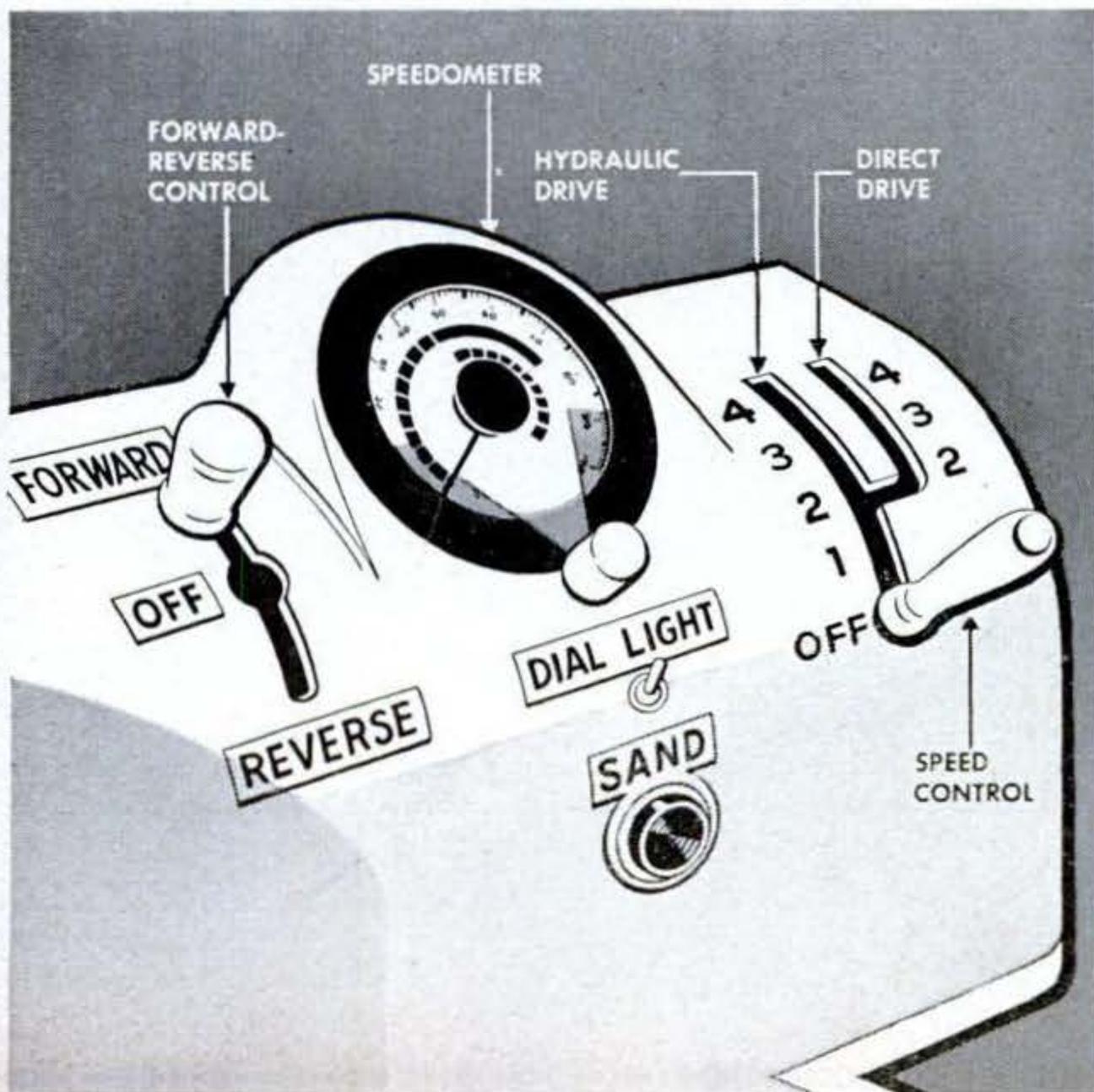
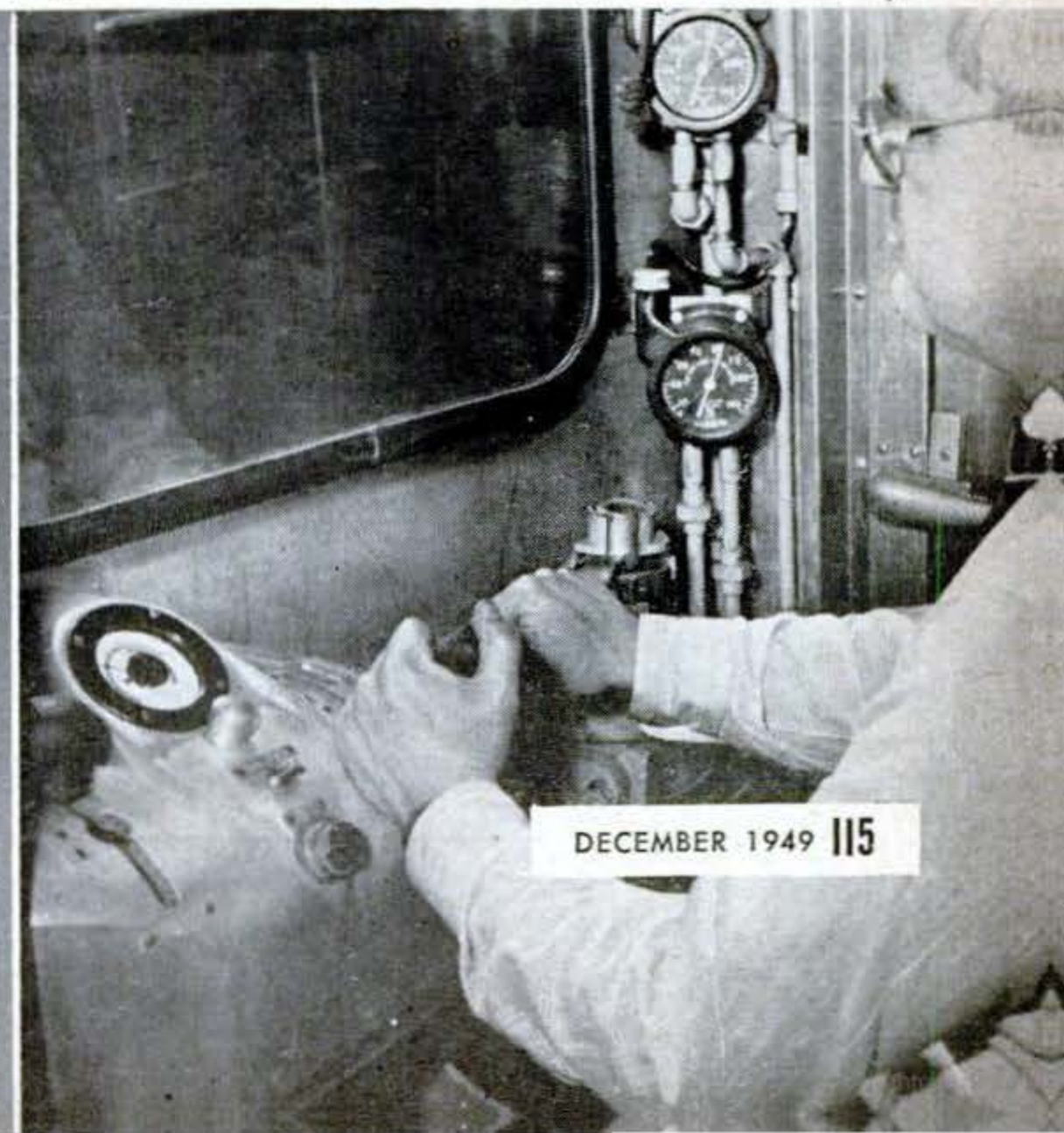
10 of these self-propelled cars may be coupled together for a train without a locomotive.

Each cab has controls shown below. Knob at left presets gearing for forward or reverse. Speed control at right uses hydraulic drive to accelerate, direct drive at running speeds.

Engineman at controls, below, operates speed-control handle with left hand. His right hand grasps air-brake control lever. Car was speeding along rails when this picture was made.





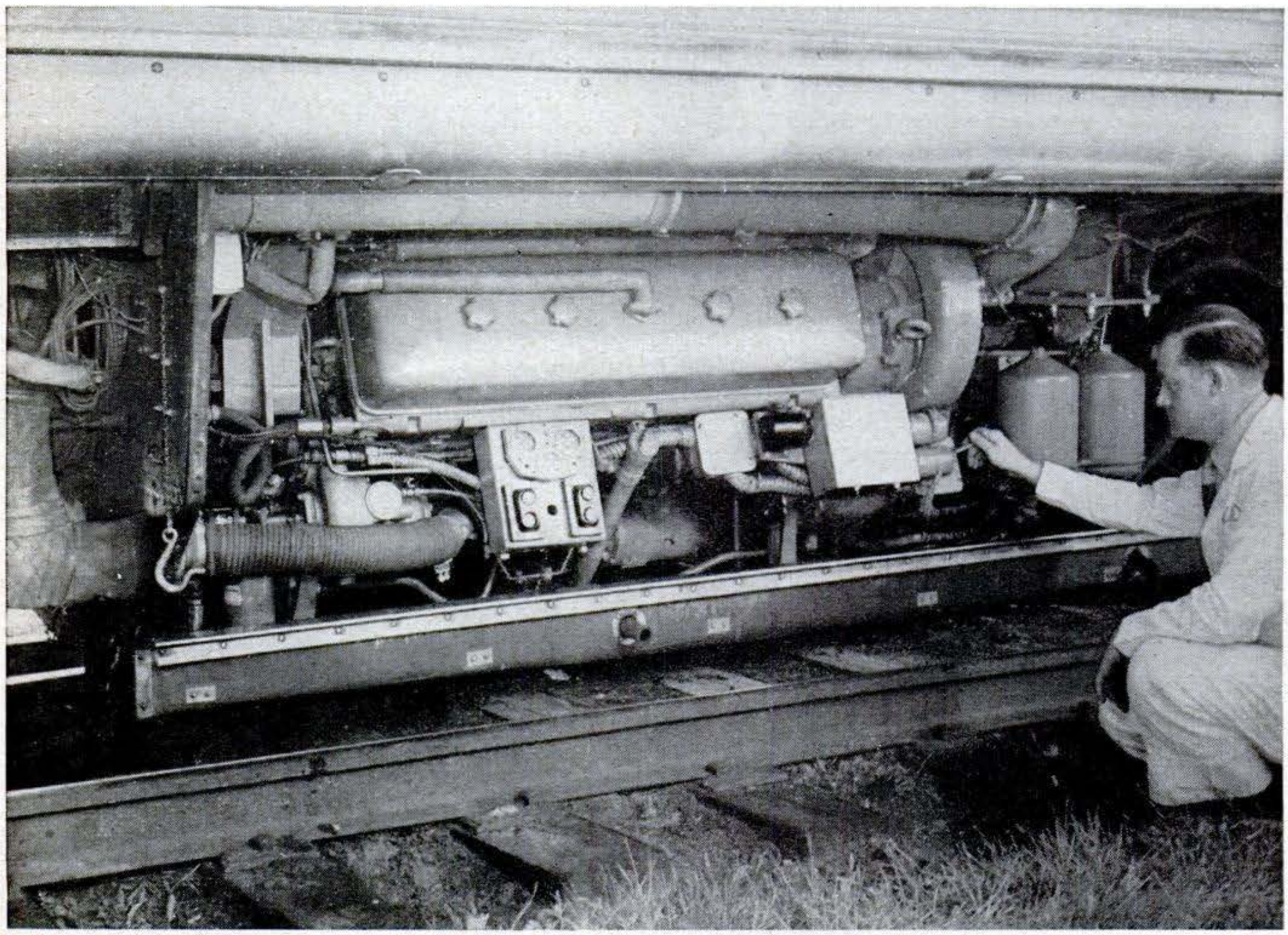
An *RDC-1* averages 3¼ miles on a gallon of fuel. Its power plant consists of a pair of General Motors Detroit Diesel engines, mounted beneath the car in compartments coated with neoprene synthetic rubber to absorb engine noise. Each engine individually drives a car axle through a hydraulic transmission and torque converter, similar in principle to those used in automobiles (PS Feb. '48, p. 113). At running speed, the engineman shifts from hydraulic to direct drive. If desired, the transmission may be preset to make this shift automatically at any desired speed.

Starting so smoothly that you don't know you're moving unless you look out the window, the lightweight car accelerates from a standstill to 44 miles an hour in only 60 seconds. Disk brakes, an innovation of Budd design (PS, Feb. '48, p. 139), stop the car with comparable speed and smoothness.

Passengers' comfort particularly impresses a rider. There's extra leg room. Year-round air conditioning suits the season. With Diesels quieted by sound insulation, passengers may converse without raising their voices. A rider could stand in the aisle with his hands in his pockets while the car smoothly starts and stops, instead of having to clutch for support.

For railroad companies as well as their passengers, the *RDC-1* has attractive features. At the announced price of $128,750 for each car, a train of three *RDC-1 s* would cost $386,250 and would seat 270 passengers. This compares favorably with a conventional train consisting of a small Diesel locomotive and three standard 54-passenger coaches, costing a total of about $465,000 and seating only 162 passengers. The train of *RDC-1s* would thus have a decided advantage in lower first cost and, says Budd, in lower operating expense as well.

Soon the *RDC-1* will be joined by two similar self-propelled types—the 71-passenger *RDC-2* with a baggage compartment, and the 49-passenger *RDC-3* with baggage and mail compartments. Unlike some experimental lightweight trains, all the *RDCs* conform to existing regulations specifying strength and safety requirements for American railroad equipment. END



Six-cylinder, 275-hp. Diesel engine in soundproof compartment beneath car is one of two that propel it. Front of compartment, removed to show engine clearly, has hinged panel giving ready access to buttons used to start engine (near center of picture). Estimated time required to remove engine for overhaul and substitute new one is only 90 minutes.

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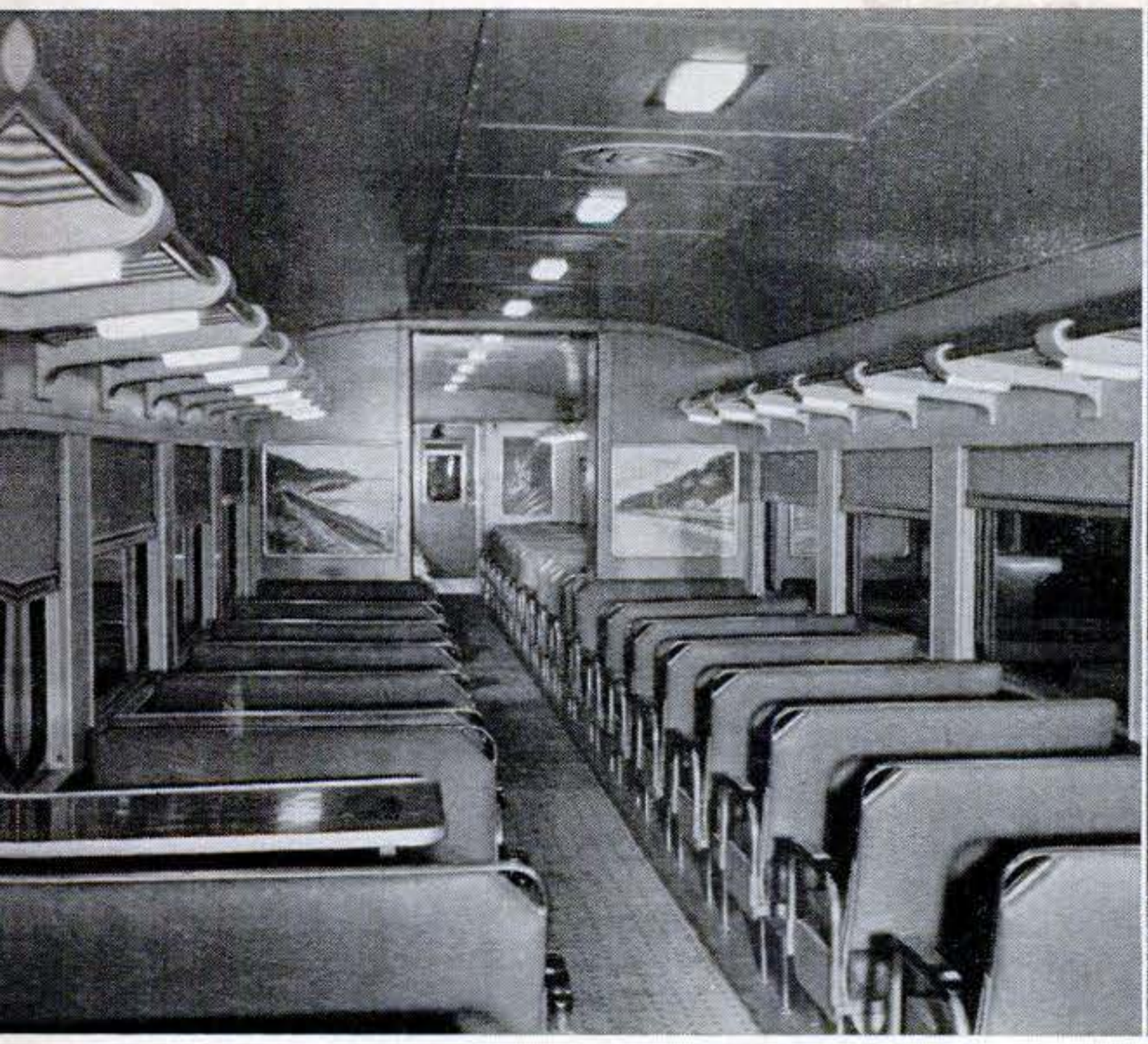
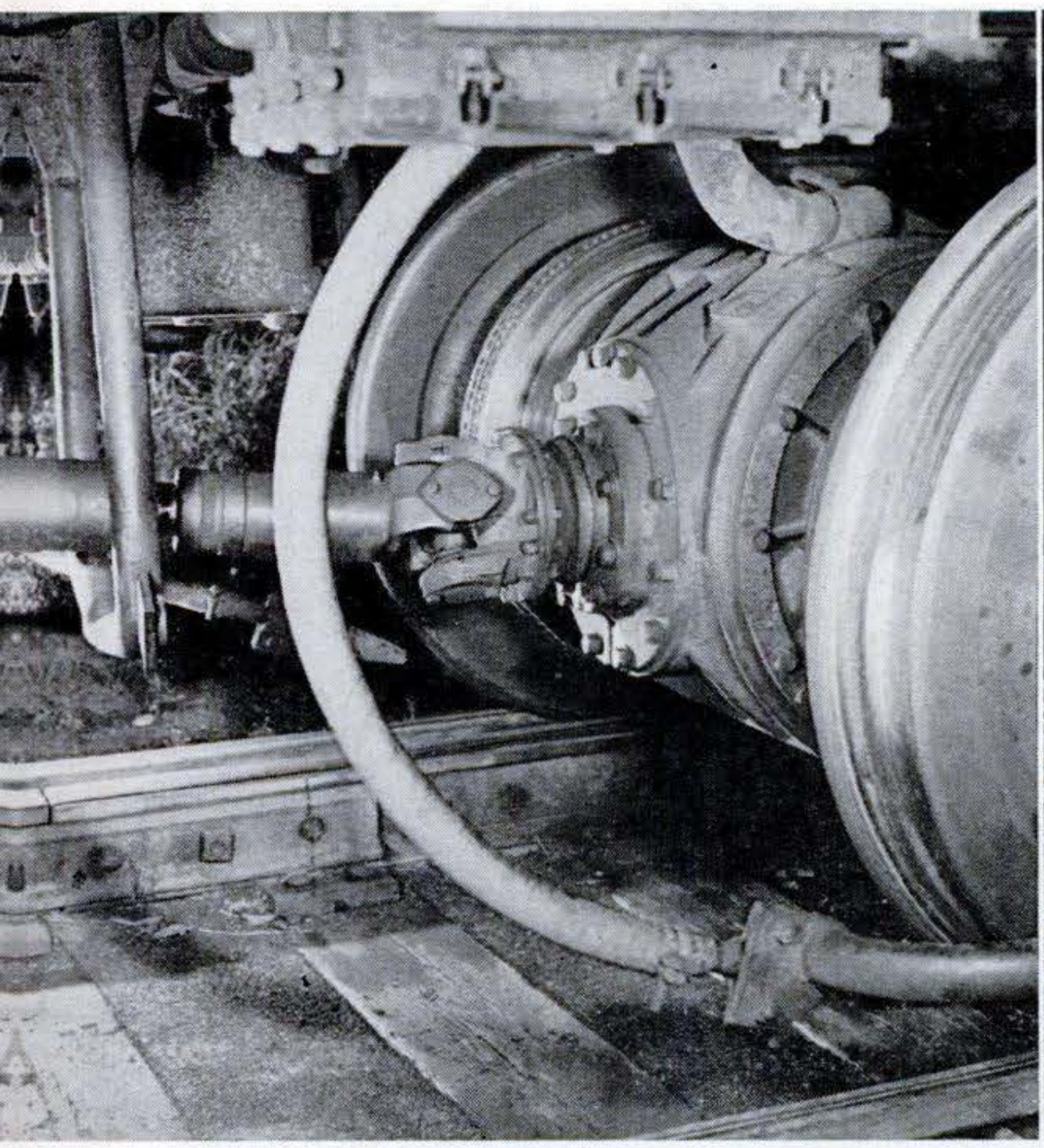
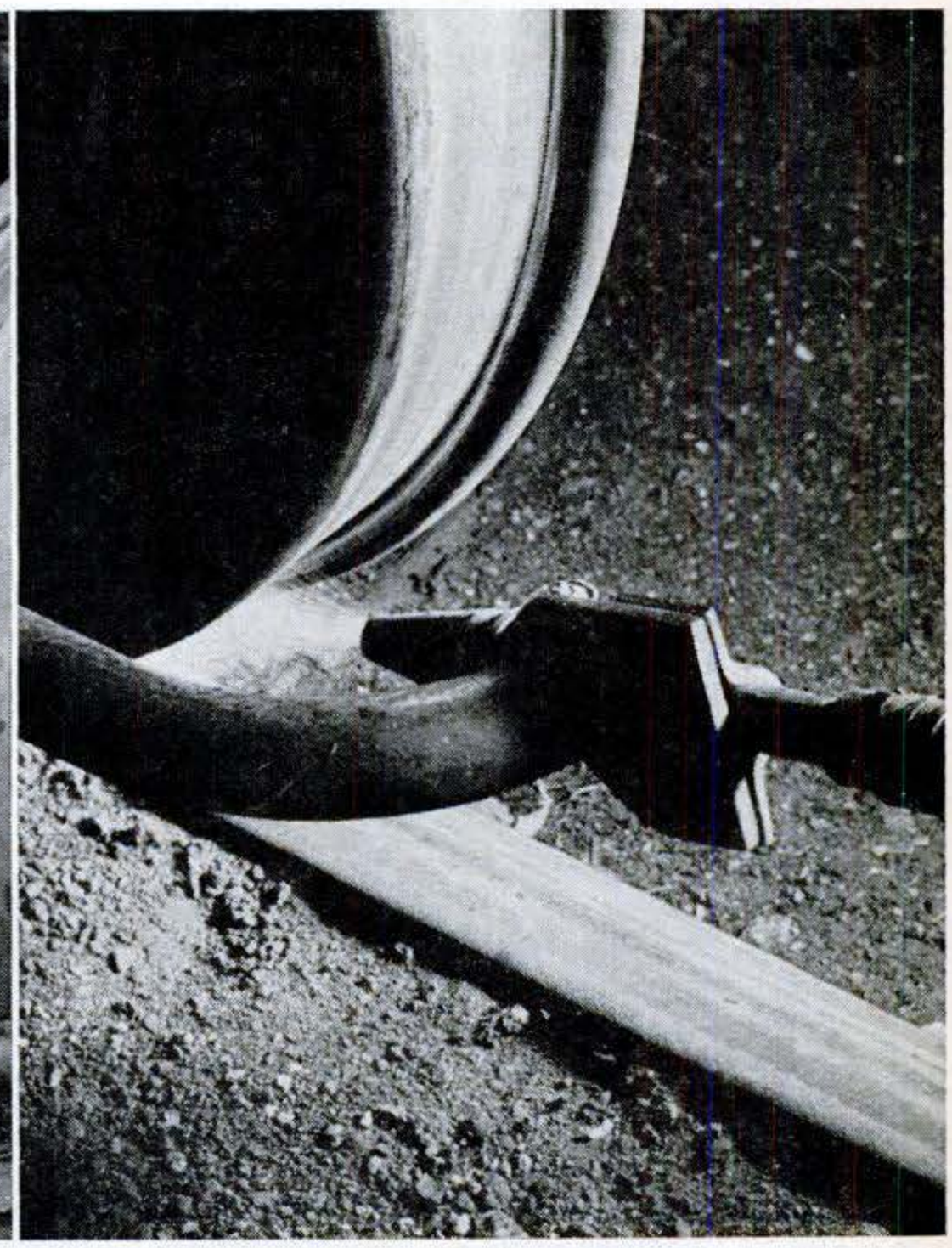


Large seating capacity of 90-passenger *RDC-1* is seen in interior view. Partitions at each side of aisle in background of picture are only at about midpoint of car's 85-foot length. They contain engine exhausts and water piping to engine-cooling radiators on roof of car.

Passengers have unusual leg room in comfortable seats, designed especially for *RDC-1*, which are low enough not to need footrests. Spacing is generous 36 inches between seats' centers. Smoothness of ride and air conditioning add to luxury of travel in the new rail cars.



Universal joint in the center transmits power to gear on wheel axle. No differential is used. Another universal at engine end of splined drive shaft allows wheel truck to pivot though engine is fixed to car frame. The splines permit change in effective length of drive shaft.



Nozzles spray sand beneath wheel of each truck, either automatically or by manual control, for traction during braking. Disk brakes of Budd design bring car to exceptionally quick and smooth stop. They replace conventional brake shoes that act on wheel rims, causing wear.

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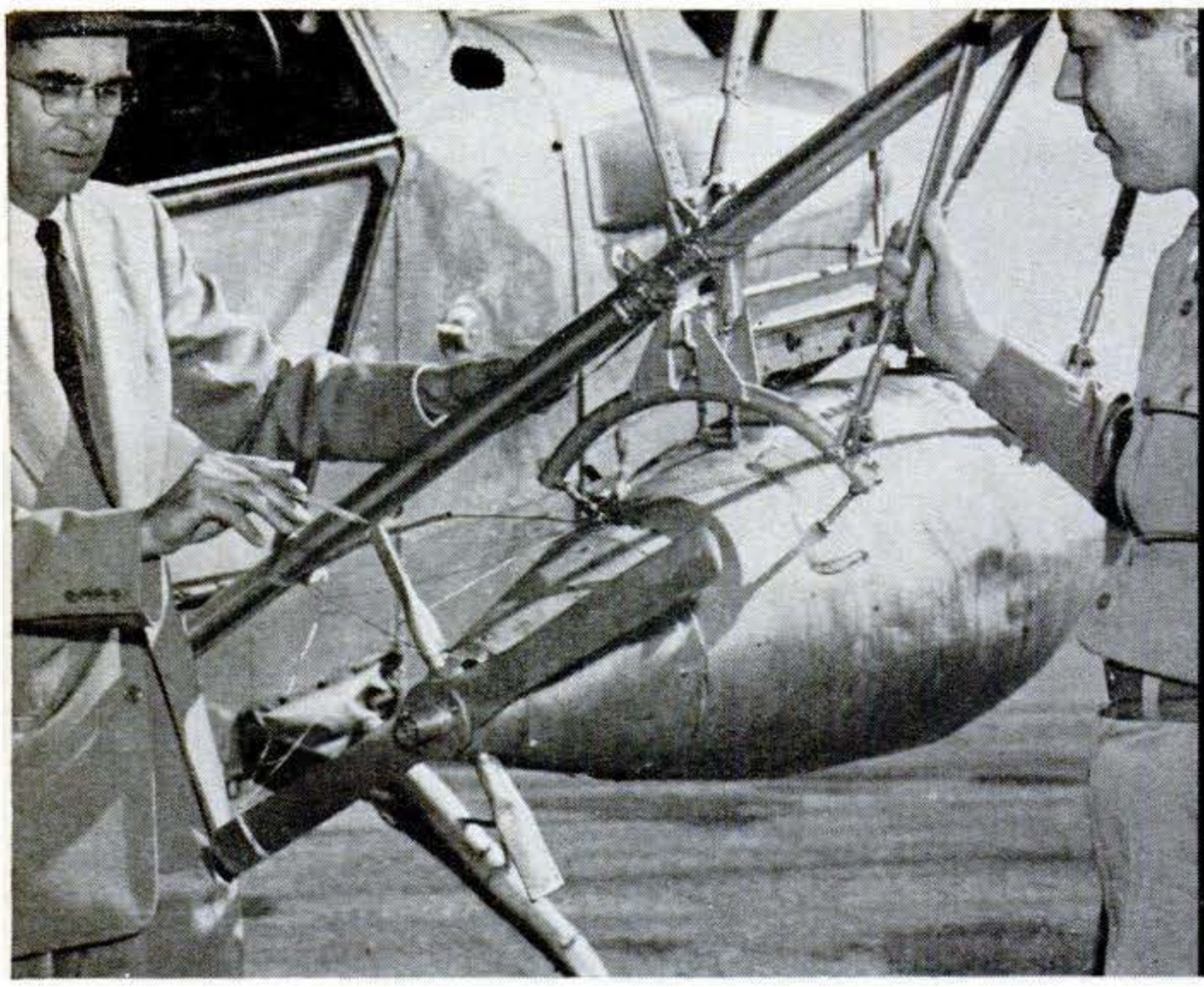
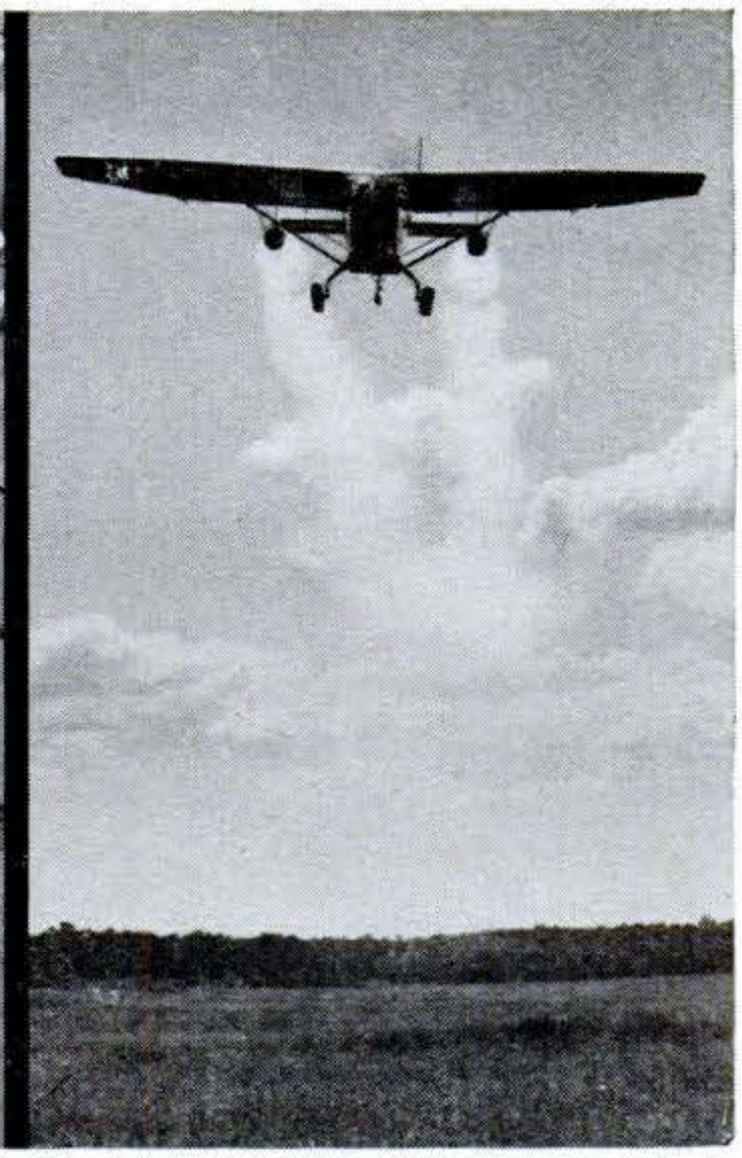
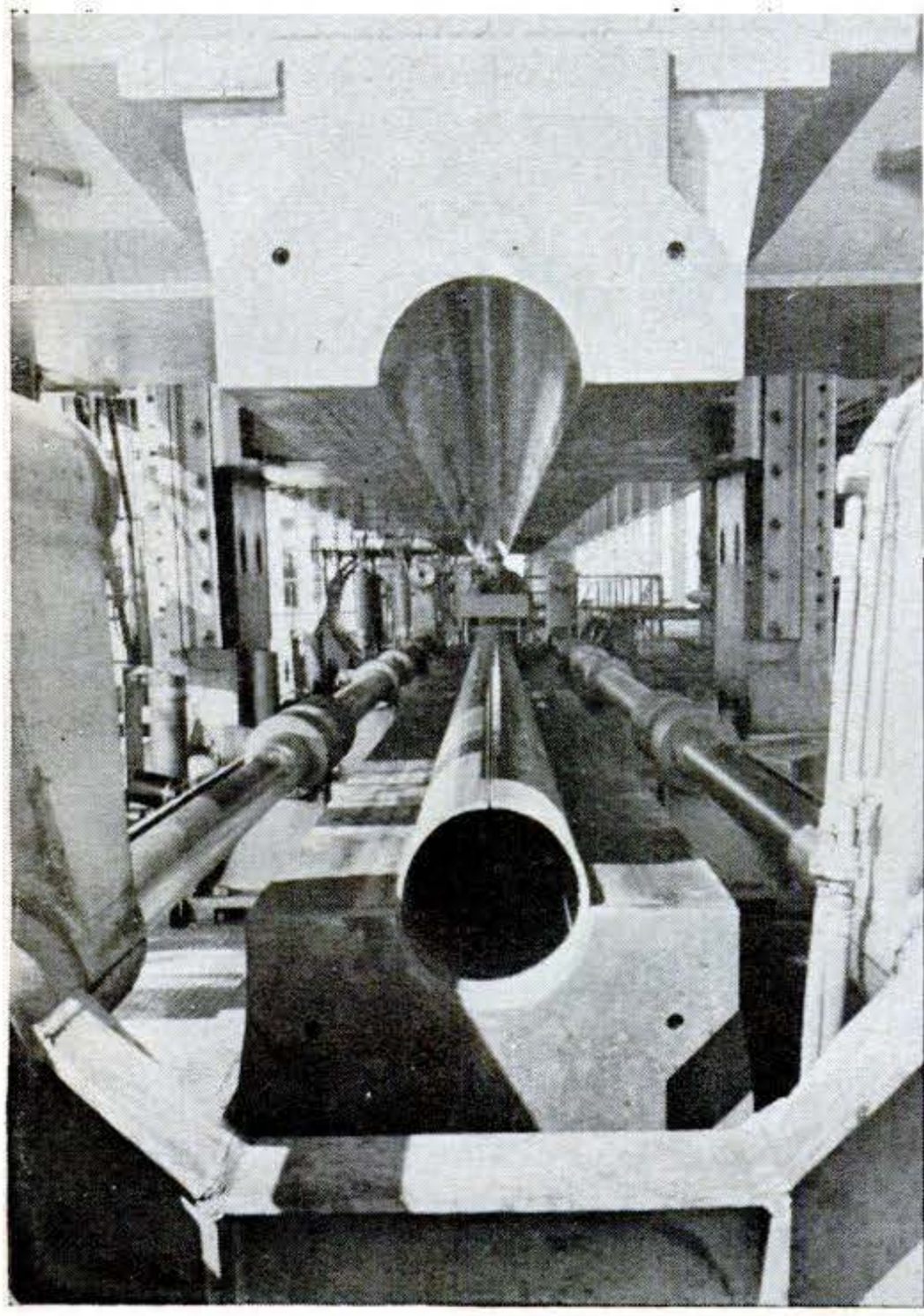




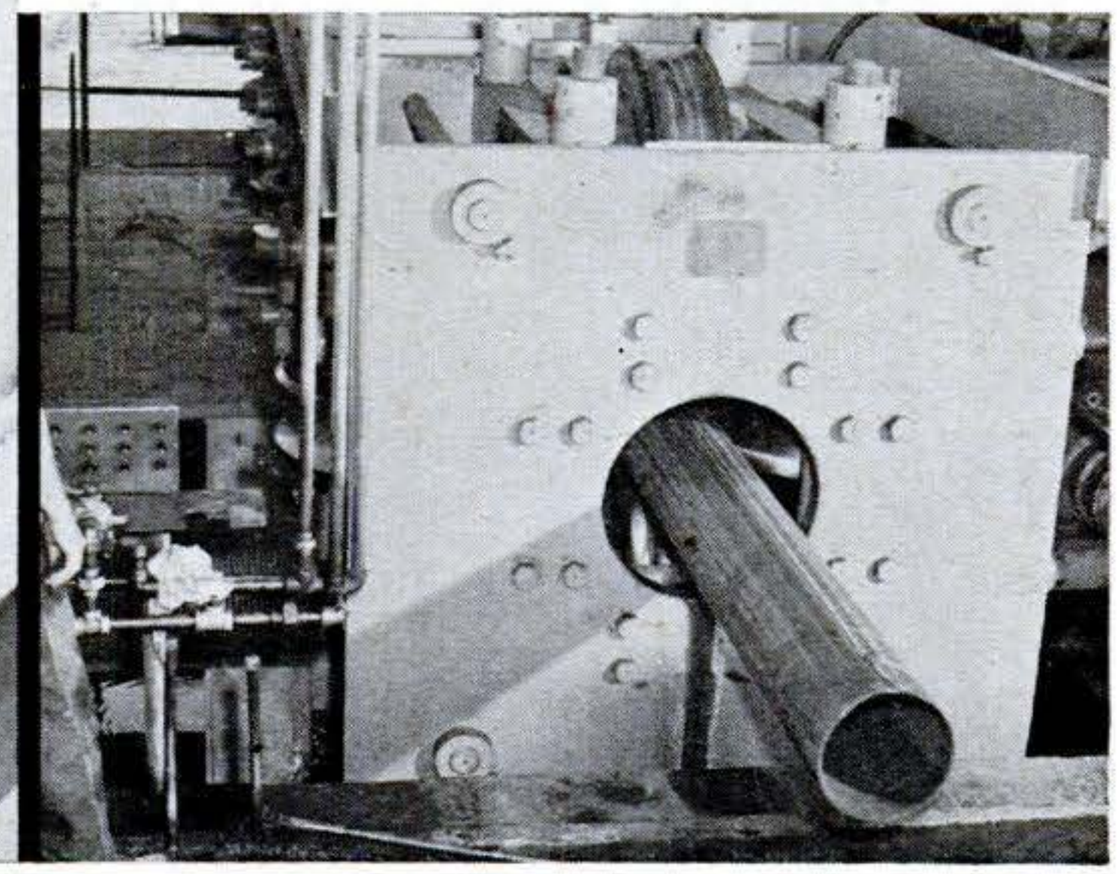
Flying Windmill Sprays DDT

HERE'S a new wrinkle in spraying insecticides from planes, developed by the Air Force. At left above is one of the new bomb-shaped, 25-gallon DDT dispersal tanks that are mounted under the wings of an L-13 liaison plane. The larger, air-driven propellerlike blades on its tip spin the whole rear nozzle and also drive a pump inside the tank. This pump helps gravity spray the DDT into the airstream through holes in the sides and tips of the smaller stub blades. The new system makes it easy to switch the plane from its usual military duties to aerial spraying. During a demonstration flight, right above, an L-13, flying 25 feet above the ground at 80 m.p.h., sprayed a swath of land 150 feet wide and eight miles long in six minutes.



Press Shapes Steel Pipe

THE 40-foot section of pipe at left was made in a press. It has just been formed by the two U-shaped dies of a giant hydraulic press developed by the Basalt Rock Co., of Napa, Calif., and the Kaiser Steel Corp. The dies are made of laminated semicircular plates—removing or adding plates changes the die size. Below, the welded pipe passes through a rounder and straightener.



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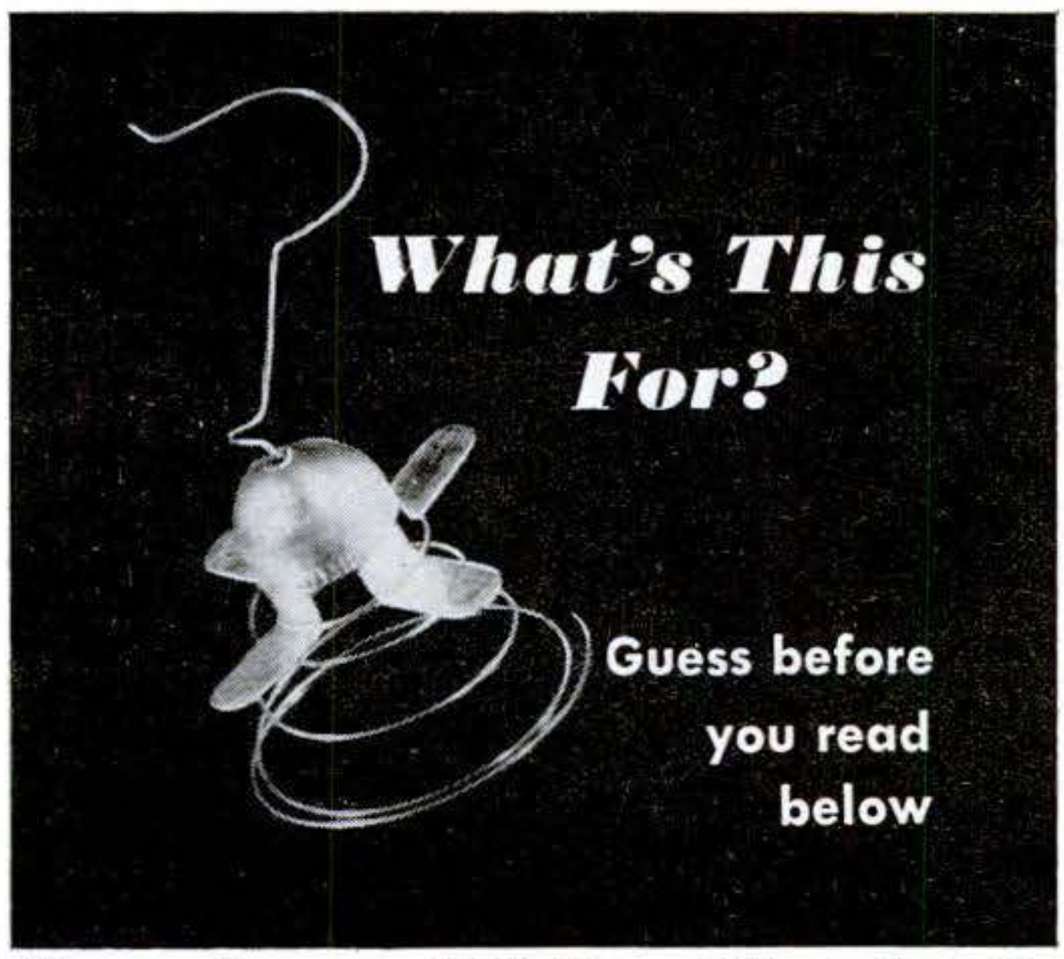
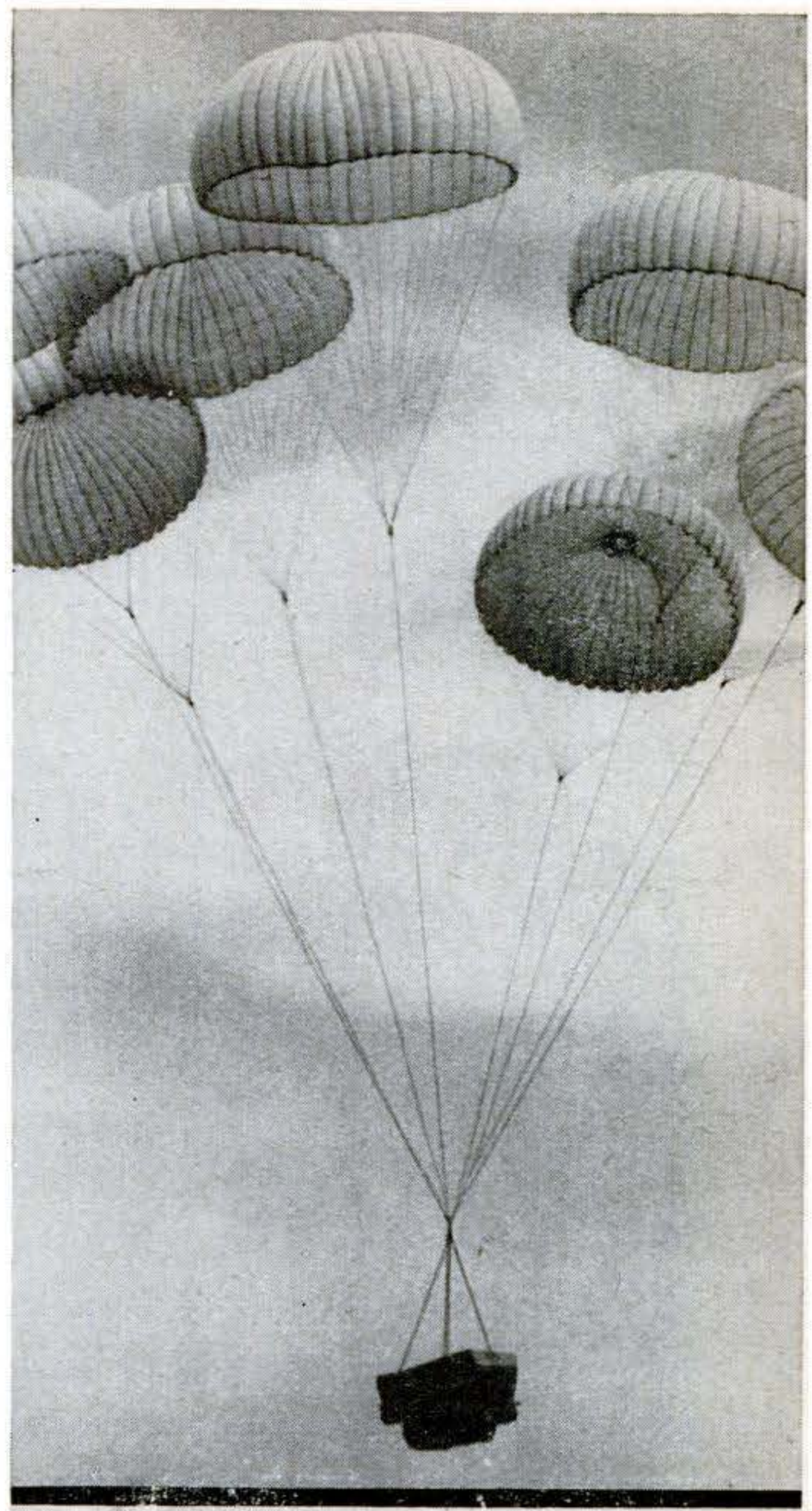
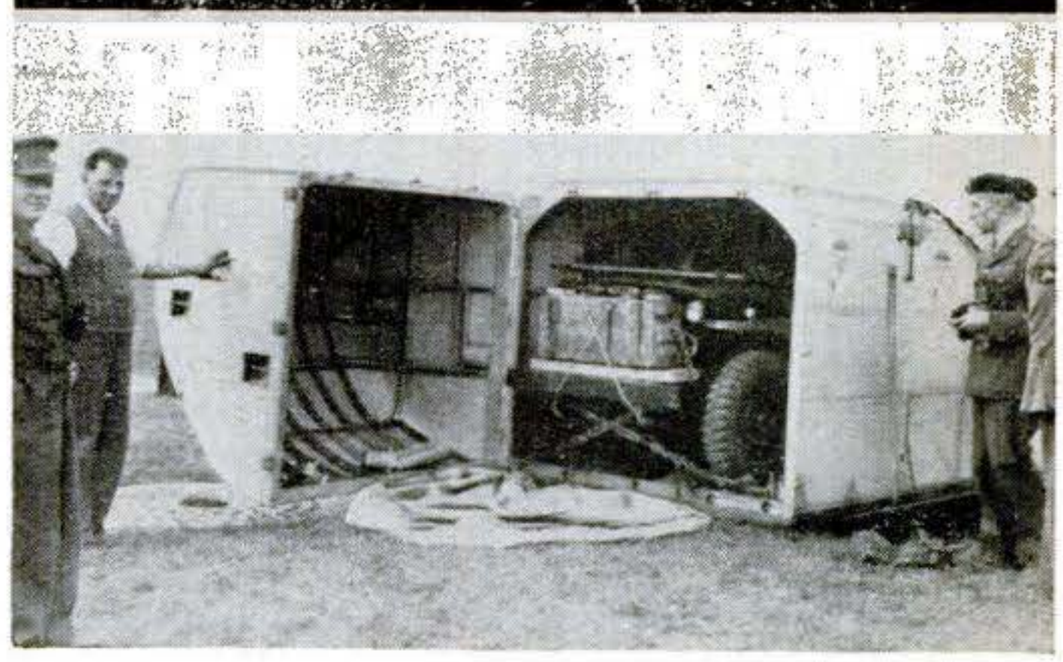
"Canned" Tree Keeps Fresh

WHEN preserved by the new method shown above, your Christmas tree is said to be as green the day you buy it as when it grew in the woods. In this process, used by Pacific Evergreens, Inc., of Olympia, Wash., the trunk of the tree is placed in a can into which a ramming machine then forces peat moss and a preservative solution under 60 pounds of pressure. Absorbing the liquid through the trunk, the tree stays fresh for about five months.



It's a new dingus, named Nifty Ornament Hanger, to reclaim damaged Christmas-tree balls. You screw the wire spiral into one whose neck has been partly broken off so that the original hook won't hold.





'Chute Box Drops Heavy Load

FLOATED down by eight parachutes from a high-flying plane, this new metal container can land both men and heavy equipment. Developed by the RAF, the Paratechnicon has a hinged bottom that opens during the drop to expose three cylindrical, inflated shock absorbers. These deflate when they hit the ground, cushioning the landing. The container carries 6,000 lb. of equipment; in this test, a 6-mm. gun and jeep.

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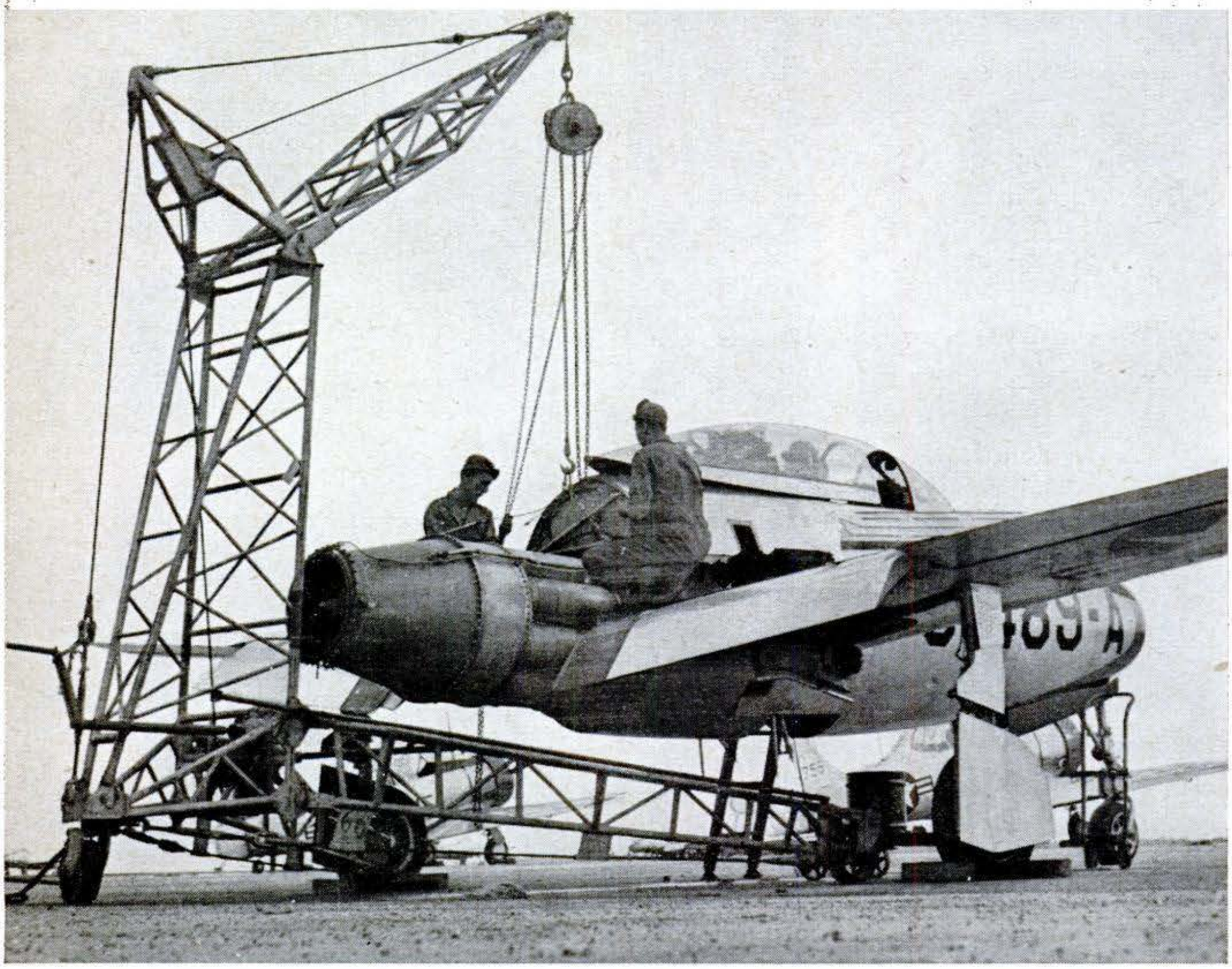

A Thunderjet fighter, with tail removed, gets the treatment from an Air Force ground crew.

Daily Physicals Keep Jets in Fighting Trim

By Herbert Johansen

When the firecan jockeys have flown their blowtorches some 100,000 miles, the doctors take over for the ground physical. Which tells you in jet lingo that after Air Force pilots have flown their 600-mile-an-hour jet fighters for 200 hours the ground mechanics pull the near-sonic planes apart for a thorough inspection and overhaul, from tailpipe to nose air intake.

Preventive maintenance is the insurance written by the Air Force for jet planes and their pilots. Mechanical inspection is continuous and rigid—daily, and then in set periods of every 25, 50, and 100 operating hours, culminating in the 200-hour teardown. These physical examinations, in the case of the F-84, involve checking over a plane made up of approximately 4,850 pounds of aluminum and 1,300 pounds of steel, composed of 165,000 individually fabricated parts, and joined into one powerful flying structure by 315,000 rivets and countless bolts.

These pages show how the skilled crews of the 33rd Fighter Group at Otis Air Force Base, Falmouth, Mass., keep the F-84 fighters flying to protect the industrial centers of northeastern United States.

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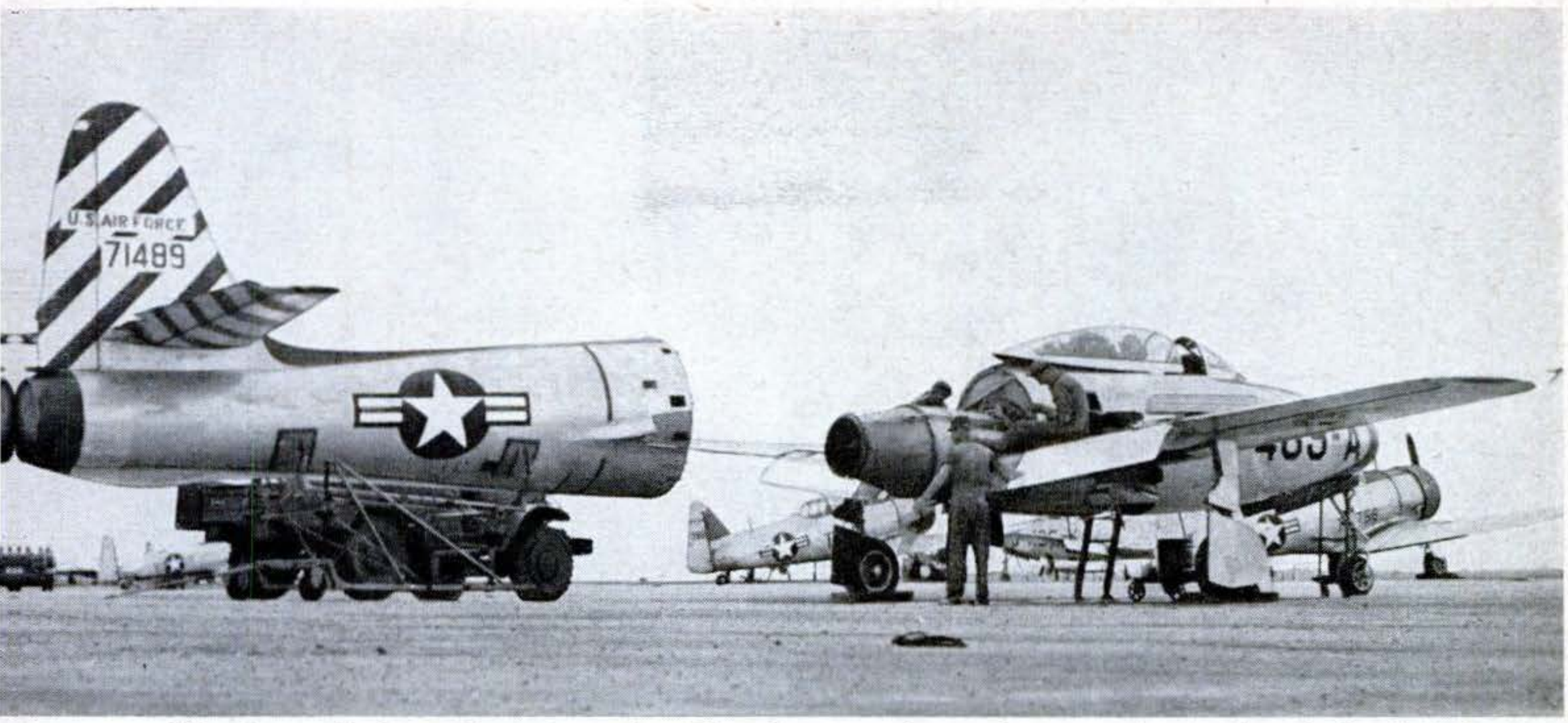
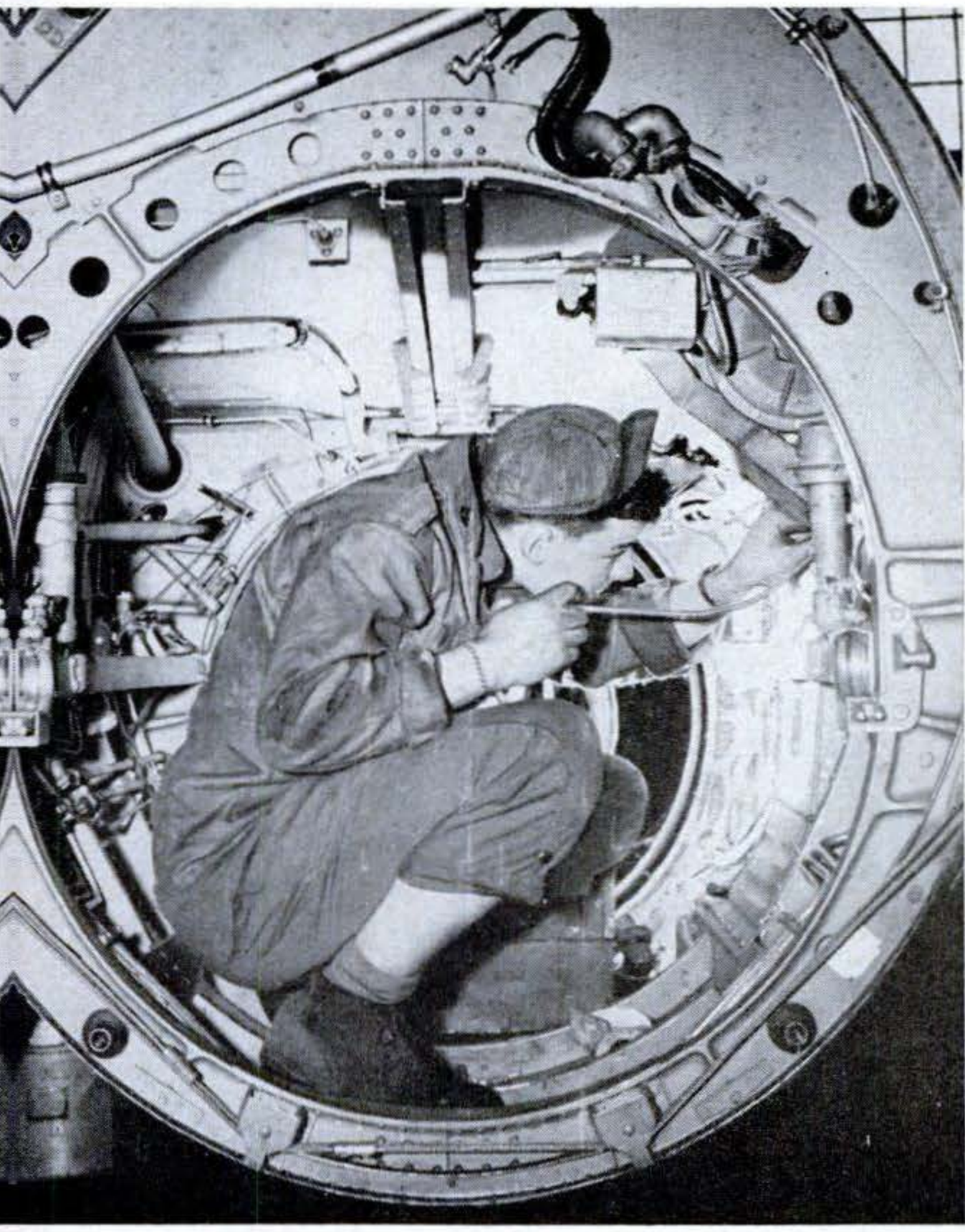


Slipping off the tail section of a Thunderjet requires the removal of only four bolts, and is routinely done after 50 hours of flight. In the photo above mechanics have wheeled the rear end away and are about to replace a jet engine after 200 flight hours. Change takes 50 minutes.



Doing an inside job during engine change, a crew chief checks the air-conditioning turbine that supplies cool air to the pilot's pressurized cockpit. The system maintains a temperature of 70° F., even when the plane is flying at sub-zero altitudes above 20,000 ft.

When she's bolted together, the mechs at Otis Air Force Base reassemble the shrouds, fairings, and inspection doors. This F-84 has been put through a 200-hour teardown. Engine already has been run up and a few more bolts will make the jet fighter ready for another tour.

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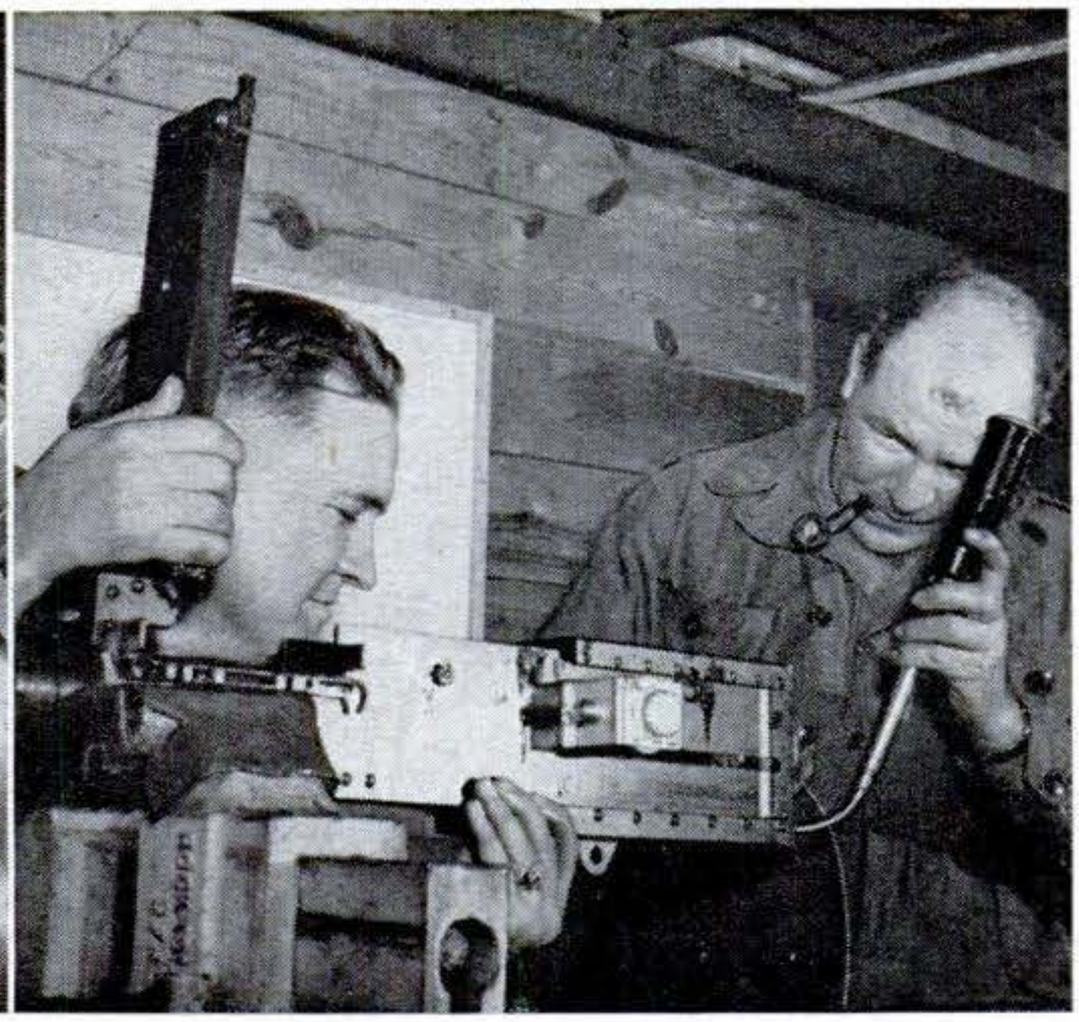
Jet "blowtorch" makes a dramatic photo during night maintenance operations. Burning gases hotter than 1,300° F. are ejected through the jet engine's tail cone at almost twice the speed of sound. Mechs on top of forward fuselage are checking for fuel and oil leaks.

The "buckets" (turbine blades) of the Allison J-35 engine, which has 4,000-pound thrust, get a careful going over with inspection light. Their job is to harness power from jet gases to operate engine compressor and accessories. If there are any cracks, engine is sent to overhaul depot.



A fighter-plane's guns must be fit. Above two armament specialists are making sure that the Thunderjet's six .50-cal. machine guns will fire. In addition to its guns, the F-84 can carry eight rockets and two 1,000-pound bombs. Fully armed, it becomes a mighty fighter-bomber.

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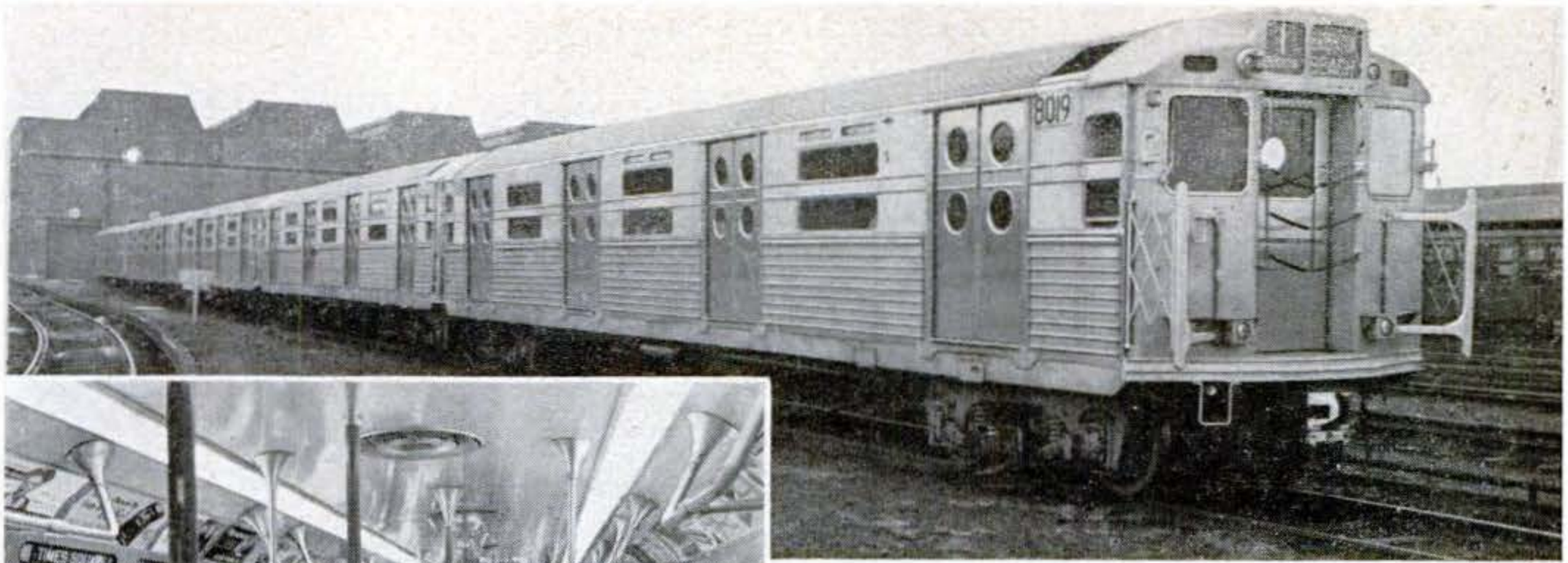

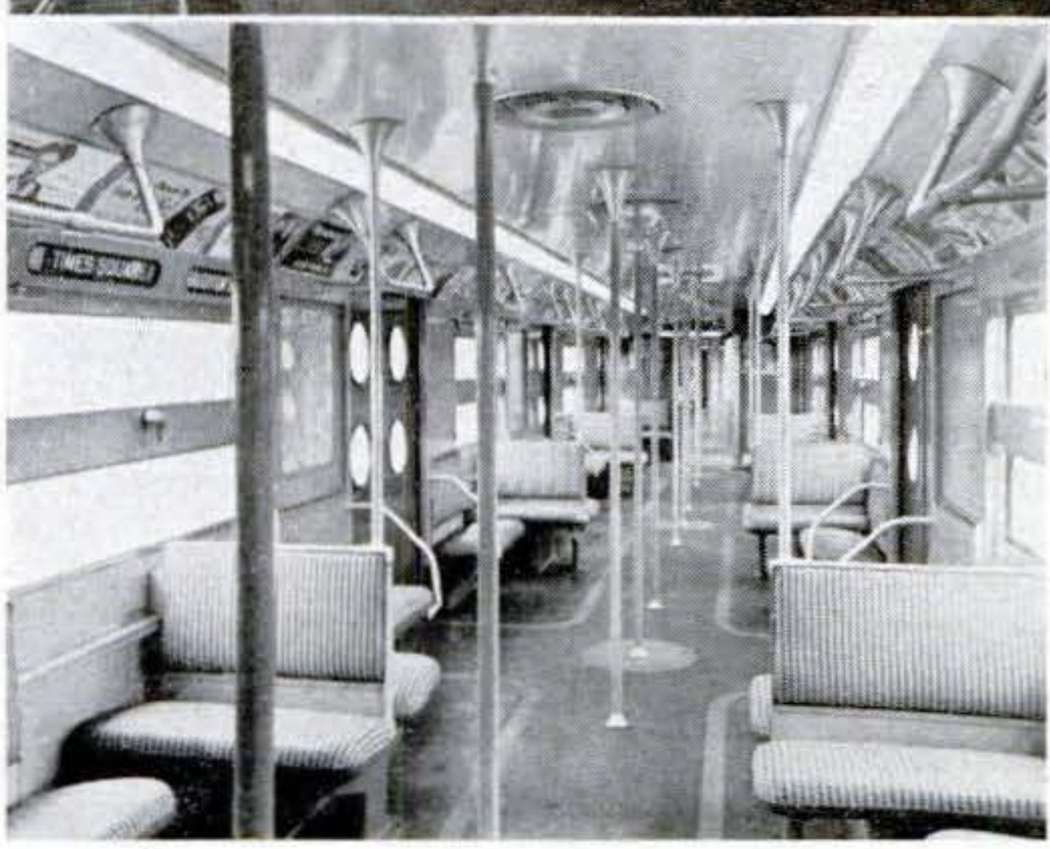

New Comfort for Subwayfarers

NEW YORKERS, accustomed to something less than luxury in their subways, were startled recently when the city introduced its new Budd-built stainless-steel, eight-car train costing almost $1,000,000.

Each car has forced ventilation of filtered, sterilized air, a PA system for announcing stations, thermostatic temperature control, and extra-wide windows (PS, Oct. '47, p. 130). Interiors have a two-tone color scheme.

Seating 54 passengers and standing more, each car is 60 feet long and weighs 81,449 pounds. Top speed is 45 m.p.h. Airplane-type shock absorbers, roller bearings, and rubber in the trucks give smooth riding.

The Height of Ingenuity

The hen-house drinking trough froze solid. Getting hot water to that trough was a must, but only a cold water pipe ran to it from a laundry tub on the porch. How would you have moved hot water through that line to save lugging it in pails?

I shut off the cold water ahead of the tubs and capped the nozzle of the mixer faucet on the tubs. All that remained to do was open both hot and cold valves. The hot water couldn't escape into the tubs, so it backed up through the faucet and through the empty cold water line to the hen house.—John R. Rose, Portland, Ore.

Less Bark, More Bite

IN THE 1950 Harley-Davidson something finally has been done about that whip-crack exhaust sound common to motorcycles. The new machine, pictured here at the Harry Ison showroom in New York, has a stainless-steel muffler producing a pleasing deep-toned sound. Horsepower is boosted to 54, a gain of about 10 percent, by enlargement of the inlet port in the overhead-valve cylinder heads. New carburetion permits range adjustment on the high-speed needle.

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What's a Christmas tree without dozens of shiny glass balls? And where do they come from? Tell Junior all about it while you trim your tree.

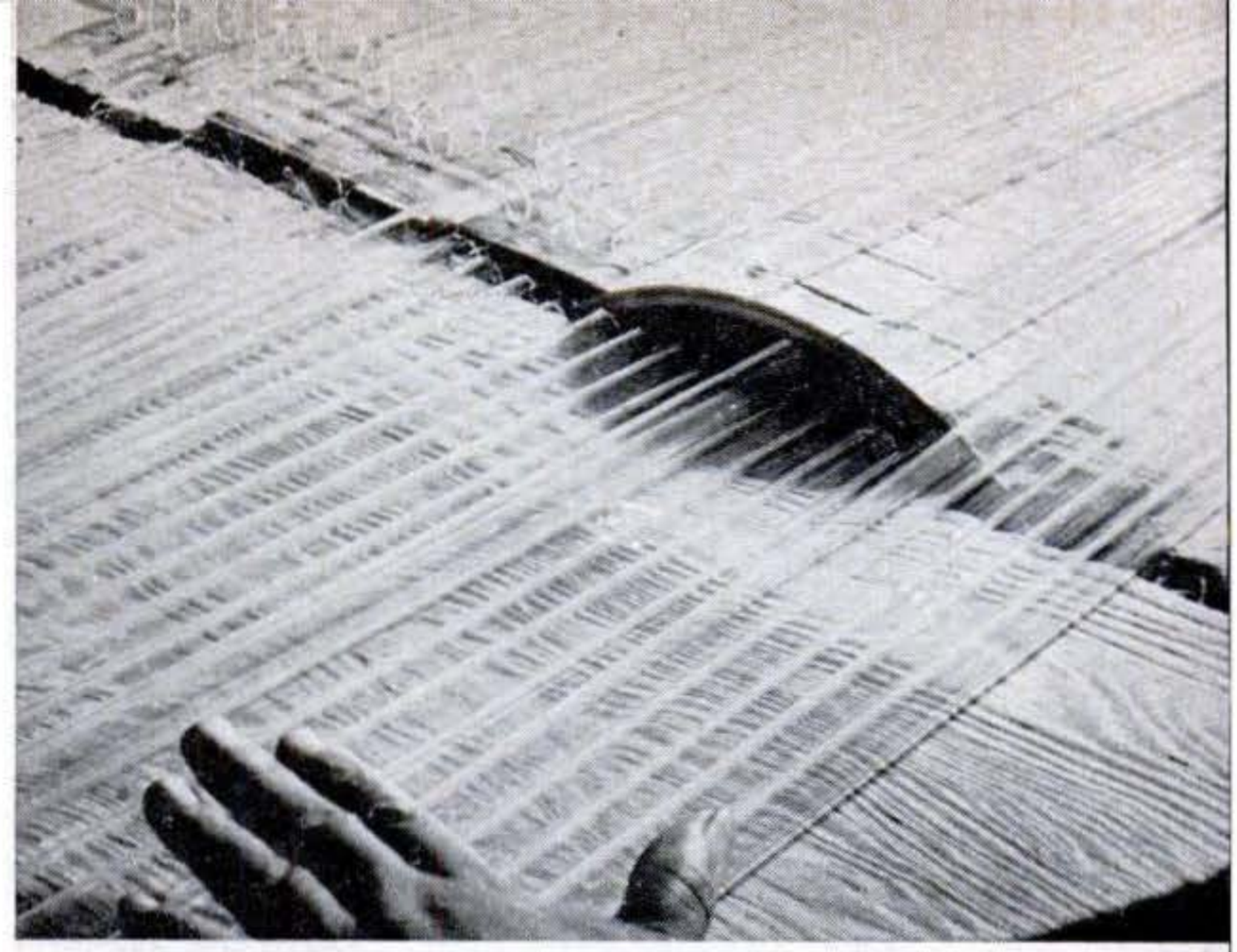
How They Make Christmas Tree Ornaments

PS photos by W. W. Morris

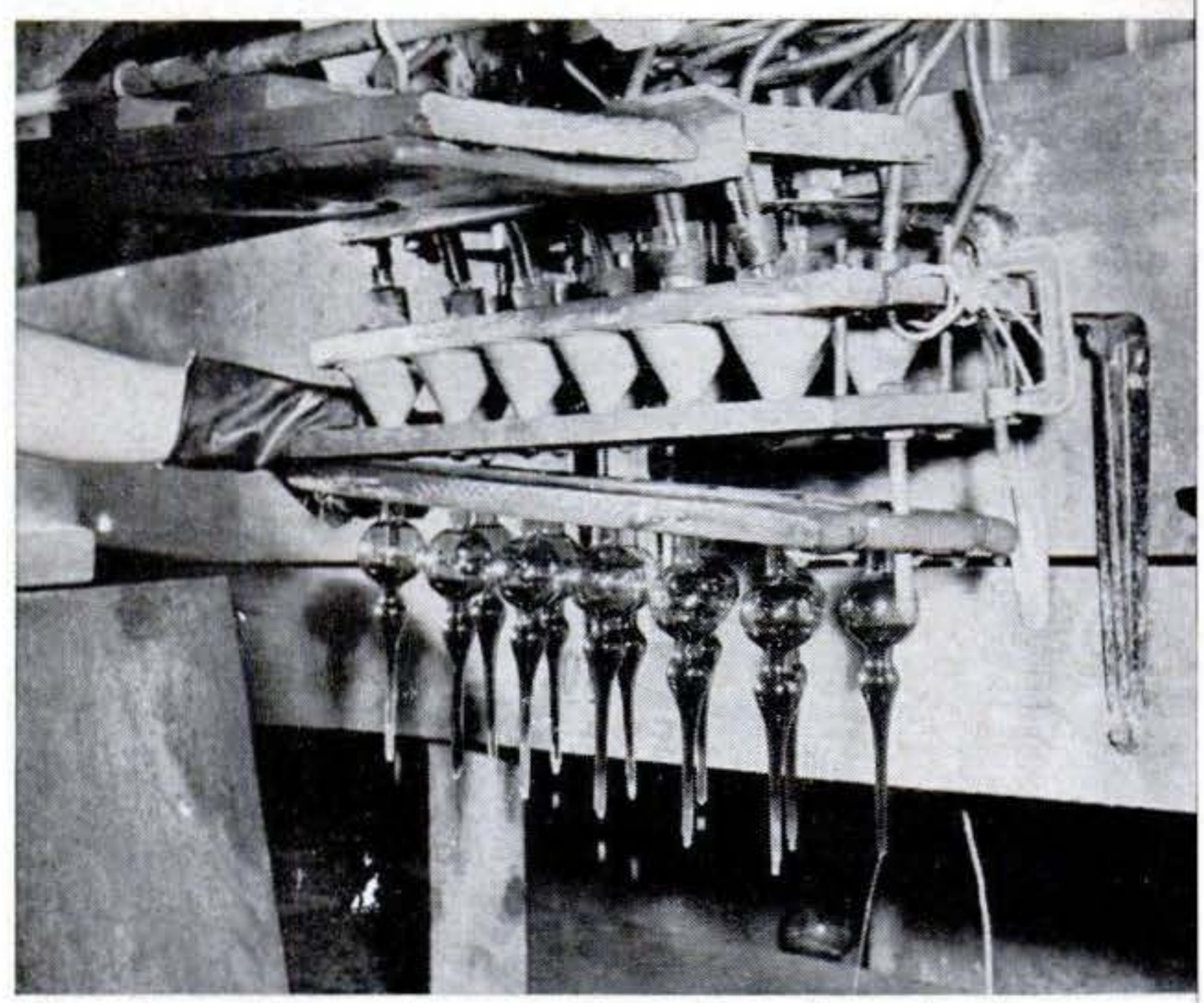
IF IT hadn't been for Hitler, those paper-thin, gaily-colored glass balls you'll hang on your tree this Christmas probably would have come from Germany. Instead, chances are they were made in a little town in Maryland.

Before the war, Harry Heim, Sr., and Harry, Jr., were interior decorators in Baltimore. The decorating business usually fell off during the holiday season. To take up the slack, the Heims began trimming Christmas trees for commercial firms. But the war cut off their best source of high-quality balls. So the Heims began making their own.

Now their factory in Savage, Md., keeps 400 employees busy turning out seventy million ornaments a year. Here's how.



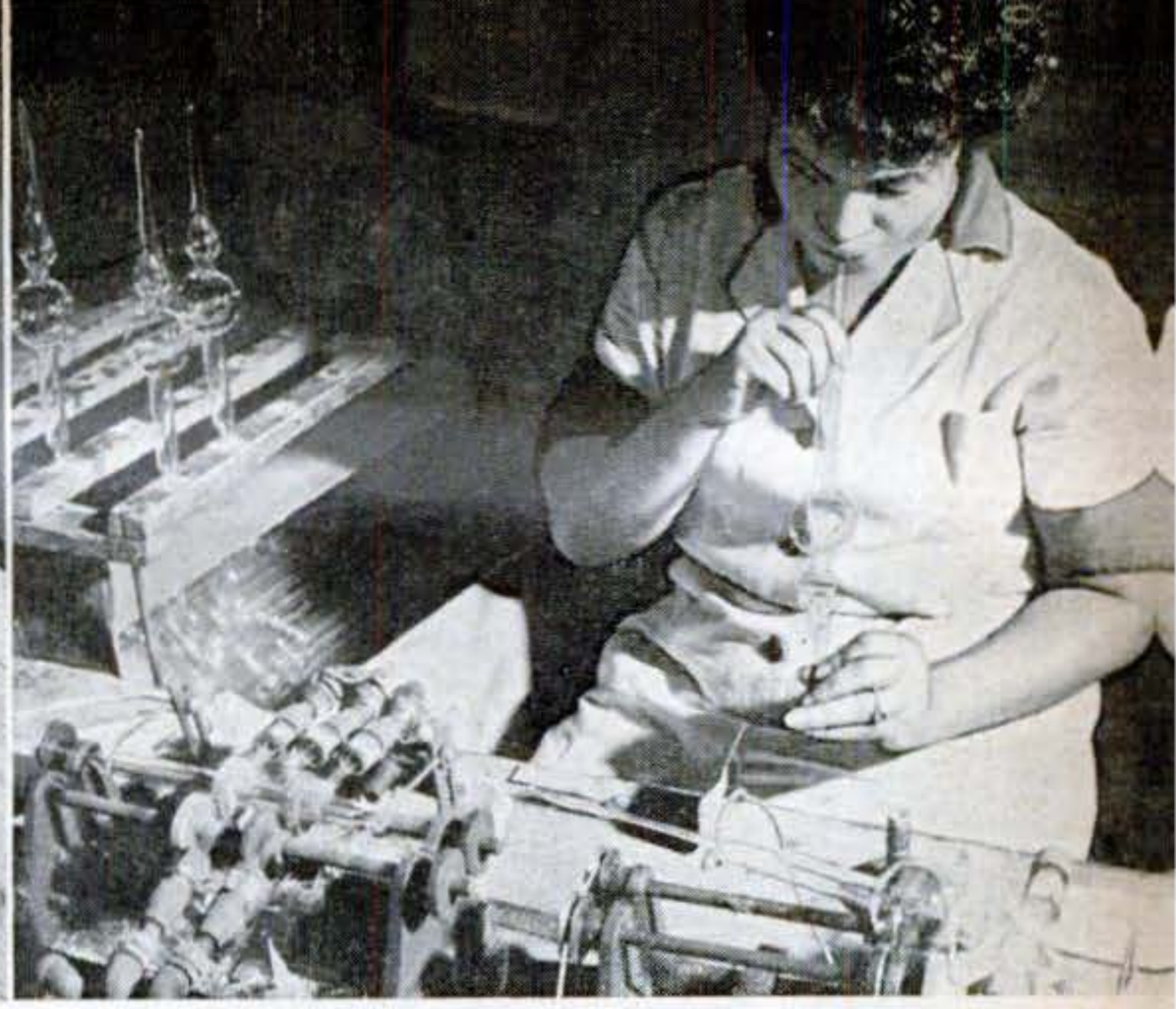
Raw glass comes to Christmas-ornament factory as lengths of plain tubing, the same kind that goes into fluorescent lamps. First step is to cut these into easily handled sizes on power saw.



The clear glass spires are then silvered on the inside by squirting them full of a strong silver nitrate solution. Special apparatus processes up to a dozen ornaments simultaneously.

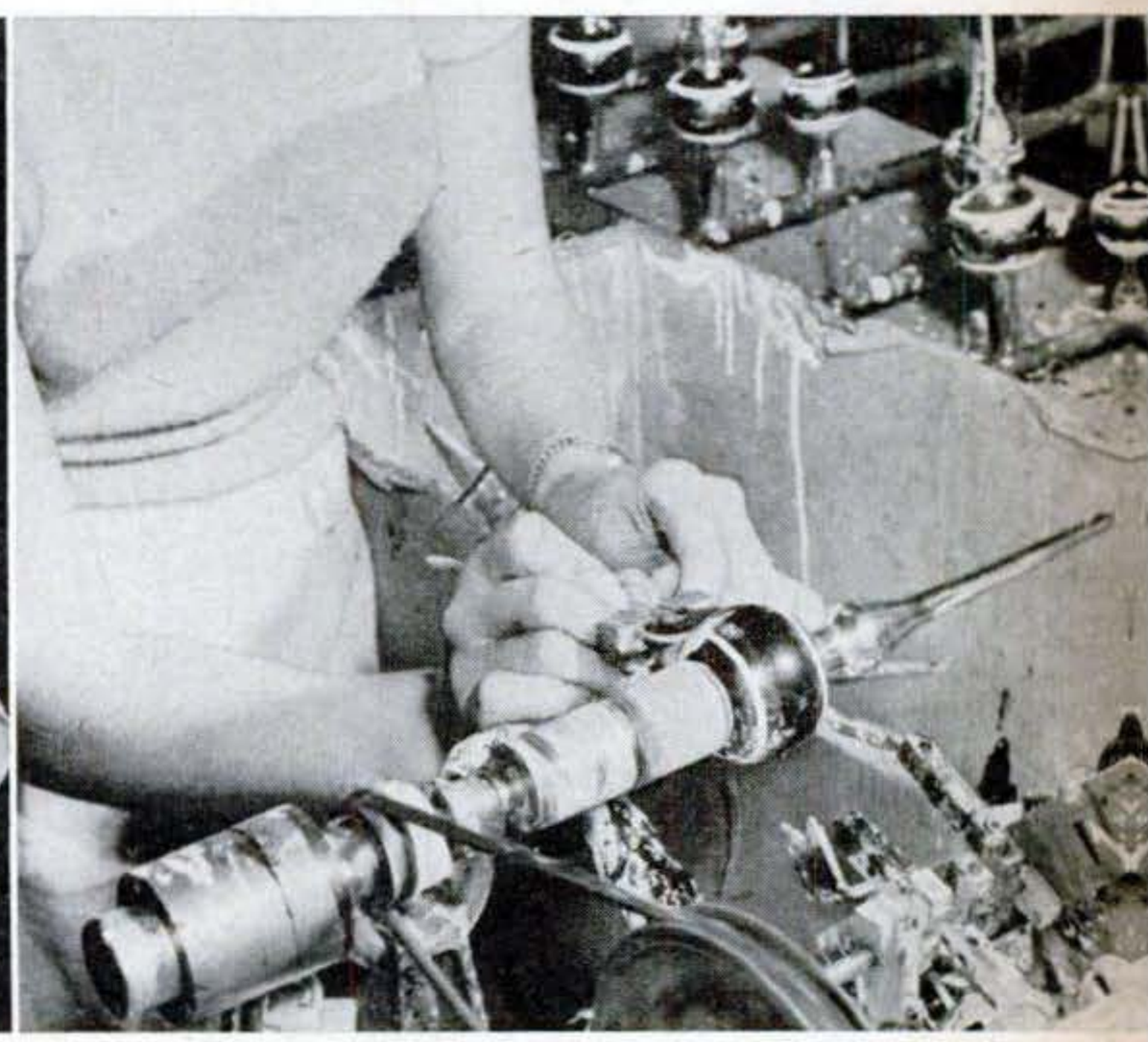
Fancier, higher-priced ornaments are hand-decorated by skilled craftsmen who think up their own designs. Long stem is left on to form a handle for decorators to grasp while painting.

Tubes are heated by gas jets in a specially designed jig. Tubes are then drawn out, stretching heated portions where glass is broken into smaller sections that go to blowers for forming.



In smaller jigs, tube sections are again heated so skilled workers can blow them to desired shape. This girl is working on pointed ornament, designed to fit over top of Christmas tree.

Worker, wearing rubber gloves to prevent blackening of hands by silver nitrate, up-ends rack and shakes out solution. At same time she inspects ornaments to insure complete silvering.



Silvered spires go to striping machine. Operator holds multiple-tip brush against revolving ornament. She can paint up to five stripes in as many different colors in one operation.

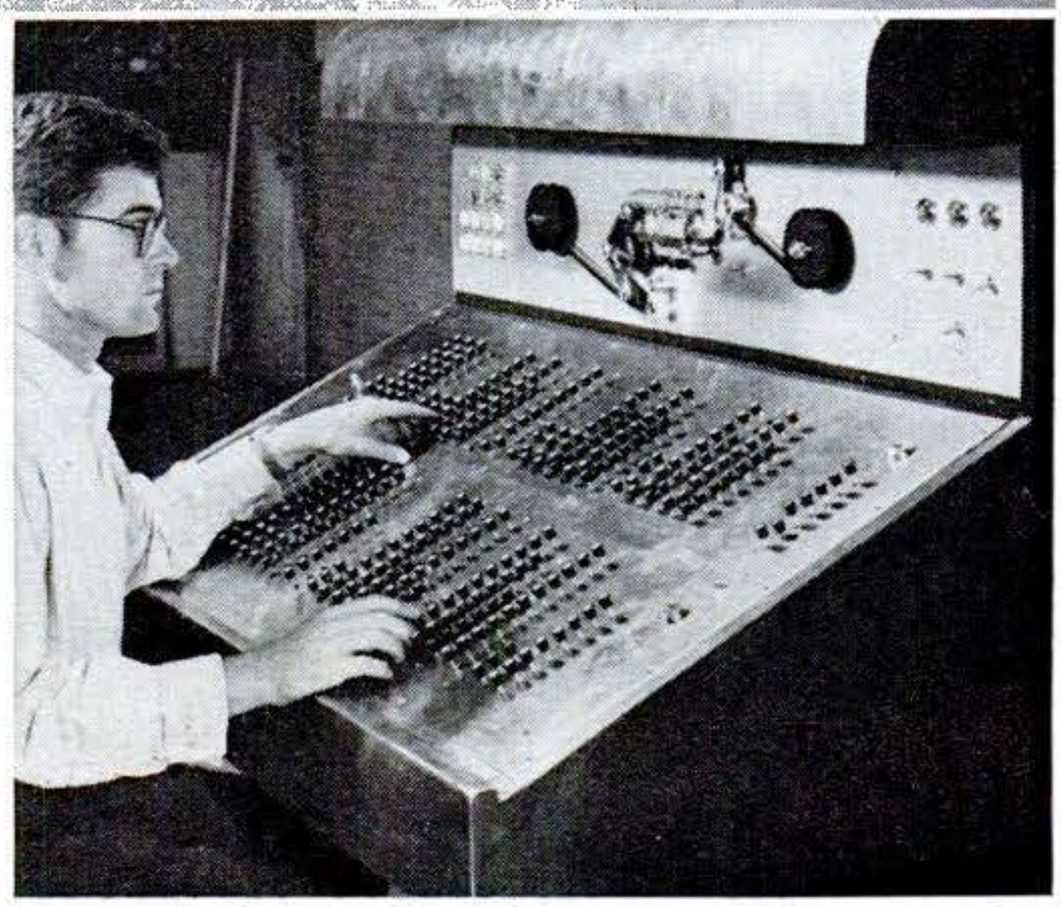
Another type of fancy ball is decorated with winter scenes, even lodge emblems, by a secret, silk-screen stencil technique. Artificial snow is sprinkled on while thick, creamy paint is wet.

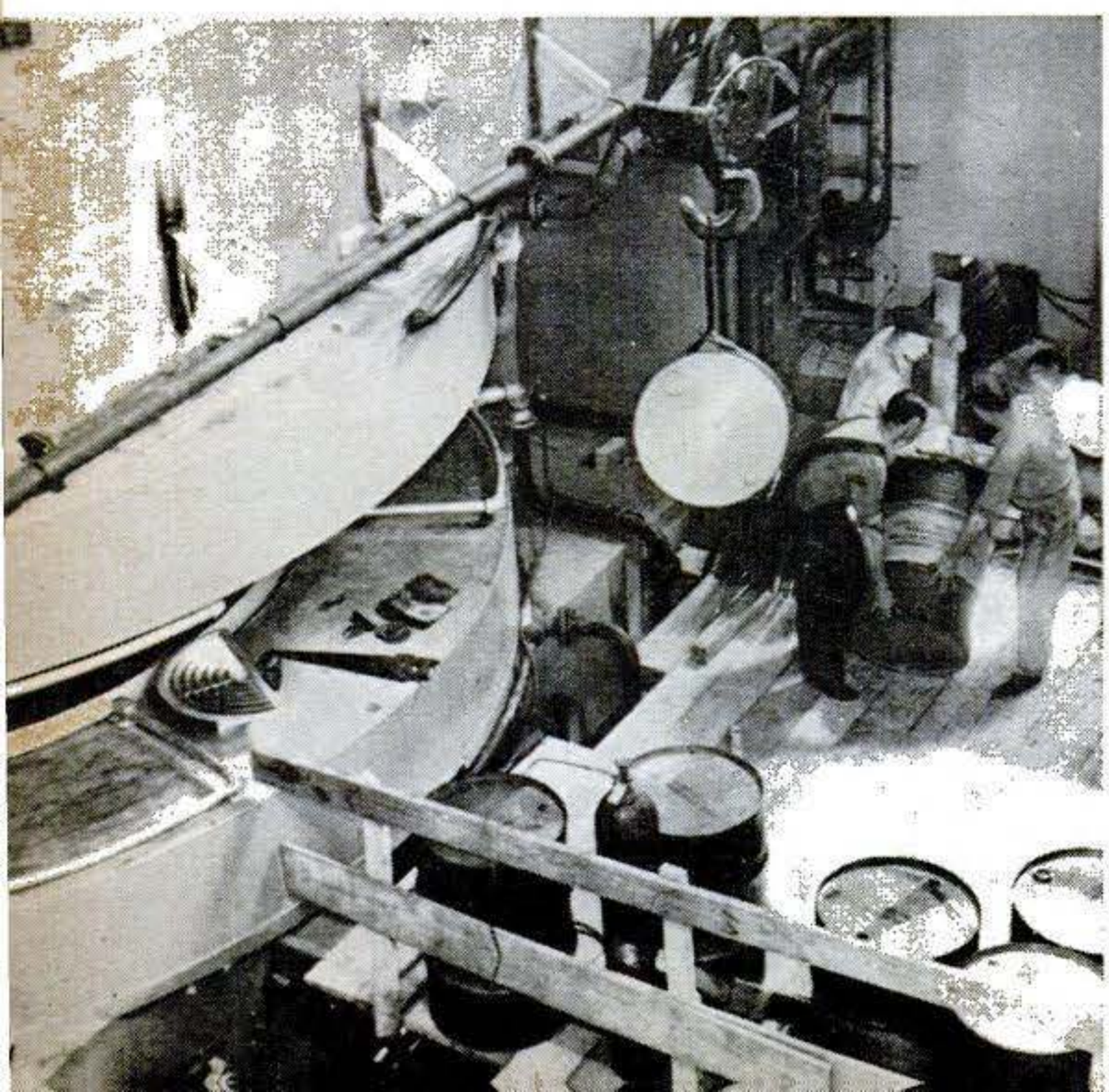
After painting, the stems on the finished balls are sawed off. The last step before packing is to fit them with caps and rings for attaching to trees. Balls weigh only a fraction of an ounce.

Navy's "Brain" Thinks Fast

MEET Mark III—newest of the giant machines that "think" better than humans in solving many problems for science. Built at Harvard for the Navy, the 30- by 15-foot monster weighs 10 tons and has 100 miles of wire, 4,500 vacuum tubes, 3,000 relays, 2,500 magnetic recorder-phonographs, and 400,000 soldered connections. It can complete big multiplications—say 9,876,543,-210,123,456 times 1,234,567,890,987,654—in a little more than 1/100 second.

Like several other computers (PS, May '49, p. 148), Mark III uses vacuum tubes to figure and magnetic recordings to remember. But it has a new, push-button gadget, called a "coding box" (right), that translates complicated problems into signals the machine can use much faster and easier. A teletypewriter can't keep up with the computer, so answers are recorded on tape.





Filling a Cyclotron Crankcase

EVEN a cyclotron needs oil—not for lubrication, but to cool the magnet that spins atomic particles at nearly the speed of light. So the Gulf Oil Corporation has developed a special cyclotron oil and donated a "crankcaseful"—900 gallons—to the Carnegie Institute of Technology for its new 400,000,000-electron-volt synchro-cyclotron. The photo at left shows the first drum being poured in. The oil will cool the magnet so efficiently that it need be only one-third the size of others of similar power. It'll be quite a job changing the oil when that becomes necessary—by then all 900 gallons will be slightly radioactive.

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Rocket to Drop Sky Eye

Sensitive thermocouples in a strange, gyro-stabilized "cannon ball" will measure heat outside the atmosphere.

By Volta Torrey

Drawings by Ray Pioch

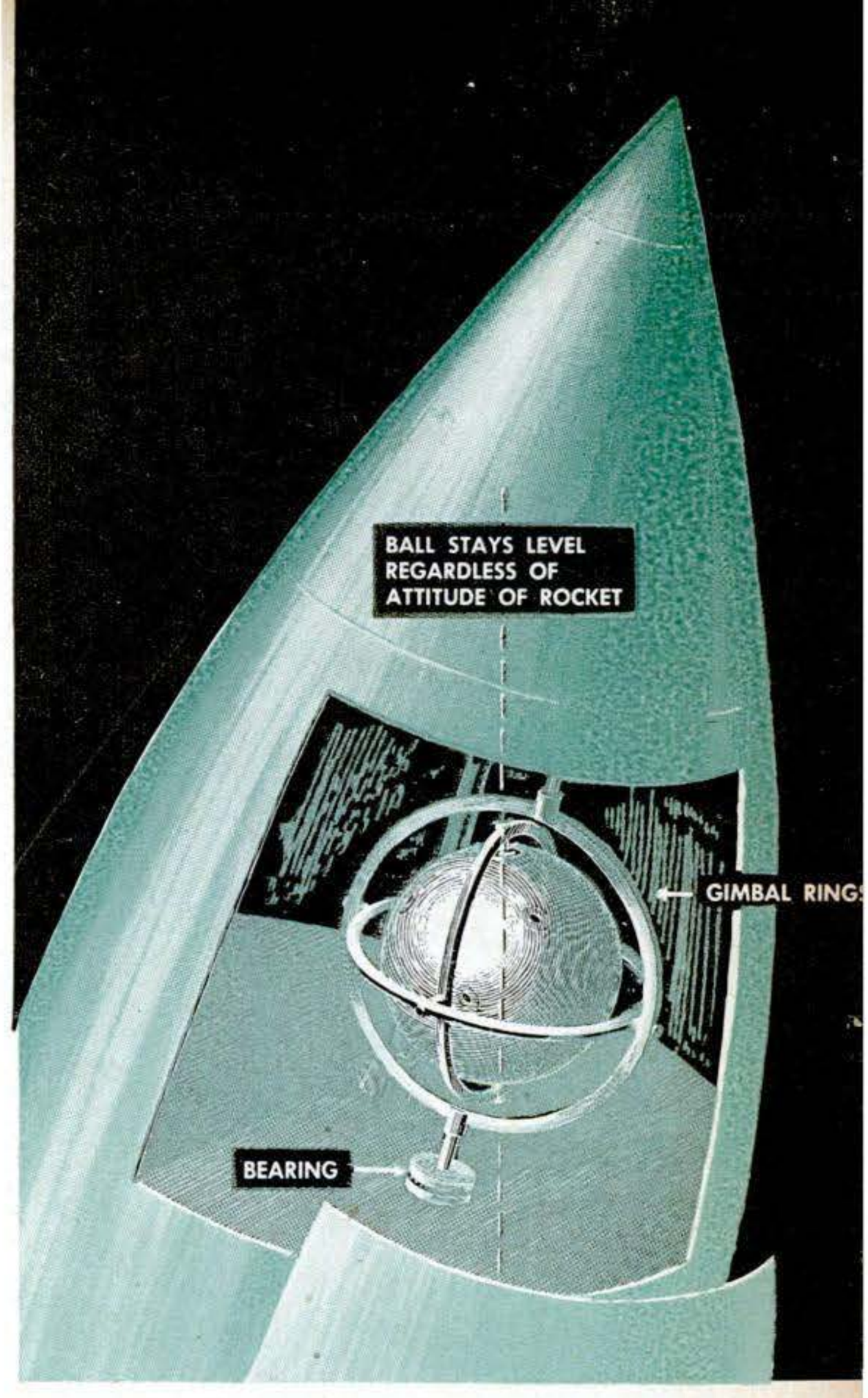
BEFORE long a rocket will rise, probably from White Sands, and let a cannon ball with 14 eyes roll out into the dark, hot space above the atmosphere. Its eyes will be thermocouples, sensitive to radiation from the sun, sky, and earth.

The ball will be stabilized by three gyroscopes, so that its man-made eyes can peer steadily into the space through which a man going to the moon would travel. Findings of these button-like eyes will be recorded by a 16-mm. movie camera that will later be ejected from the falling ball.

The ball is needed because a rocket's tendency to spin, yaw, and tumble makes it too unsteady a platform from which to measure radiation. Experiments with half a sphere floating in mercury, however, have shown that it can be so stabilized by three gyros that it will not rotate more than 5° in any plane under the expected conditions. Based on these tests, an actual ball has been designed by Dr. Severin Raynor and his associates at the Armour Research Foundation of the Illinois Institute of Technology to ride in the nose of a high-altitude rocket. Now it is being built under contract for the USAF Air Materiel Command.

The ball is too big for a man to carry easily. It will be surrounded by three supporting rings or gimbals. These will rest in rotating bearings in the rocket's instrument head so that the rocket may spin without twirling the ball around.

A door will open 115 seconds after the rocket has left the ground, and the stabilized ball with its supporting rings will be ejected from the rocket more than 60 miles above the earth. As the strange contrivance continues on in the rocket's trajectory, explosive bolts will detach the rings, and the ball will be left free in the almost complete vacuum beyond the atmosphere.



When the rocket has shot above the atmosphere, a door in its side will pop open and the ball and its supporting rings will be ejected. The rings will then be blown off automatically.

The ball will then start to fall without twisting or turning. It will have one eye at its north and another at its south pole. There will be four eyes along its equator, and four on each of the planes equidistant from the equator and each pole.

These eyes will be buttons of mica a quarter of an inch wide and only a ten-thousandth of an inch thick, bearing evaporated bismuth and antimony, and covered with black gold. The radiation they detect will be registered on the camera film.

When the ball reaches the atmosphere in its fall, the camera and its streamer will be ejected so that they will come down gently enough to preserve the record. A 400-mc. transmitter will broadcast a signal so the camera can be followed.

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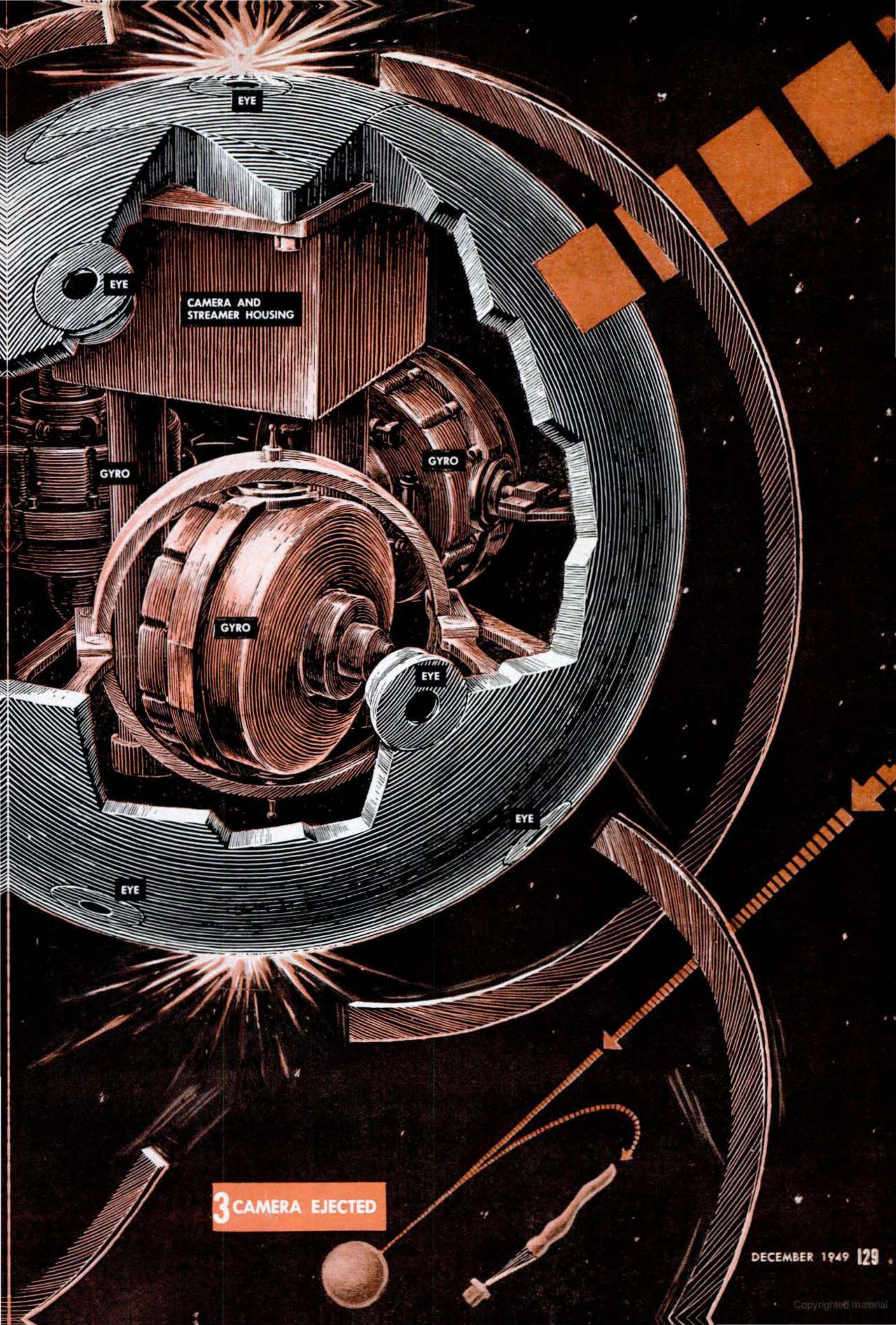
The stabilized ball with its rings will continue on its path through space but will be left behind by the rocket. The hollow bolts that hold the rings to the ball will then blow apart, detaching the rings. As the bare ball falls, heat radiation from above, below, and the sides of the ball will be recorded by means of the thermocouples in the eyes on its surface. These thermocouples will be linked to an optical system and camera within the ball. Finally, the camera and its film bearing the recordings will be ejected from the ball and will fall separately, slowed by a streamer.



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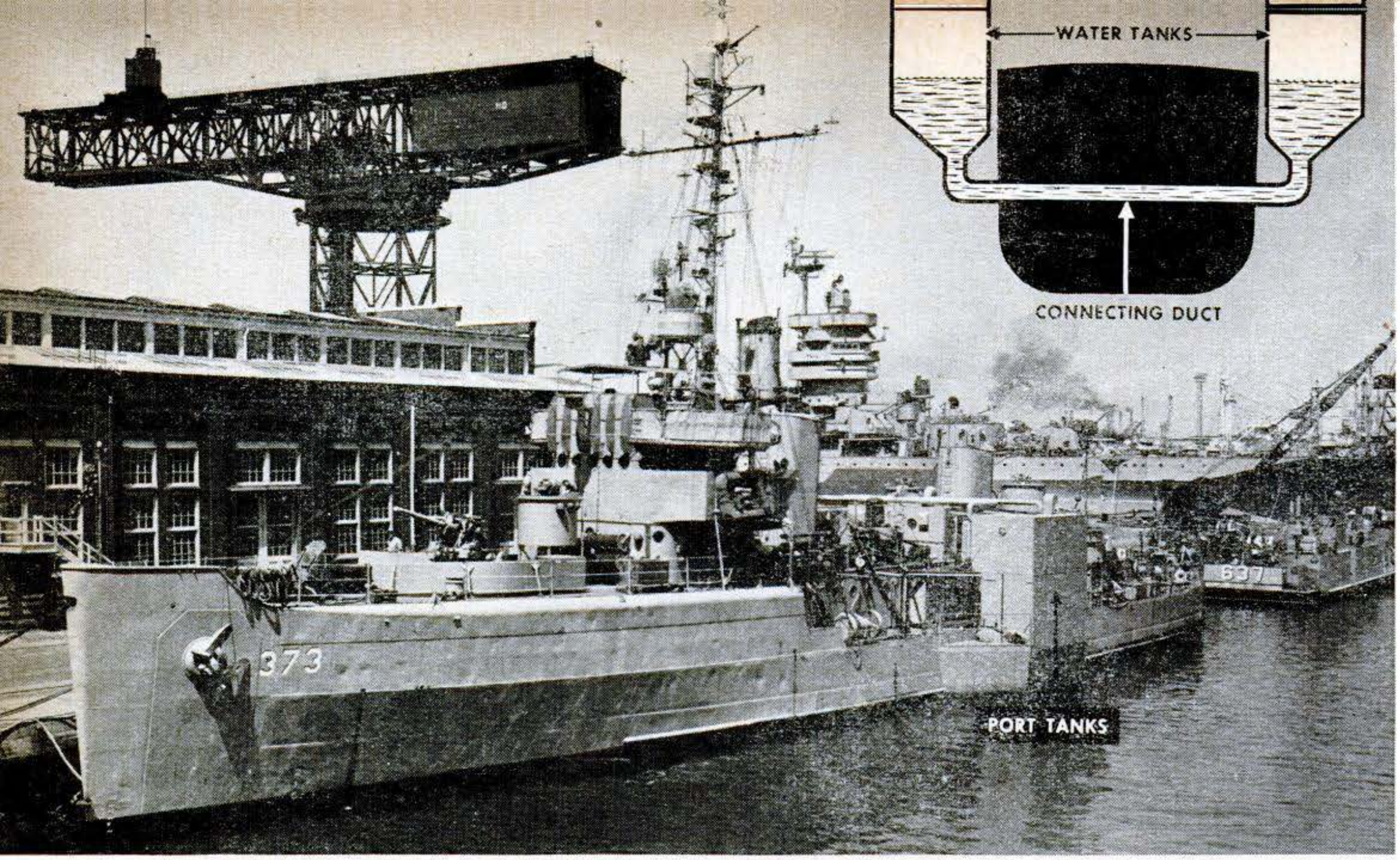


Water Tanks Steady Ship

HERE's good news for seasick sailormen. A new stabilizing system developed by the Navy is said to reduce the rolling motion of vessels by 80 percent. Shown above undergoing tests on the minesweeper USS *Peregrine*, the stabilizer consists of two pairs of partly filled water tanks mounted on opposite sides of the ship and connected by ducts. When a ship begins to roll, the start of the motion is detected by an electronic device. This starts equipment that pumps water into the up side, reversing when the roll back begins. Water thus shuttles rapidly back and forth between the tanks, counter-balancing the rolling motion.

The Navy has great hopes for its "activated tank" method of steadying its ships. Not only would a stabilized ship give greater accuracy to gunfire, but it would simplify unloading of cargo or troops in rough seas.

Gyros were never very successful as ship stabilizers due to their great weight, size, power requirements. The tank system takes only one percent of the ship's weight and two percent of its propulsive power.

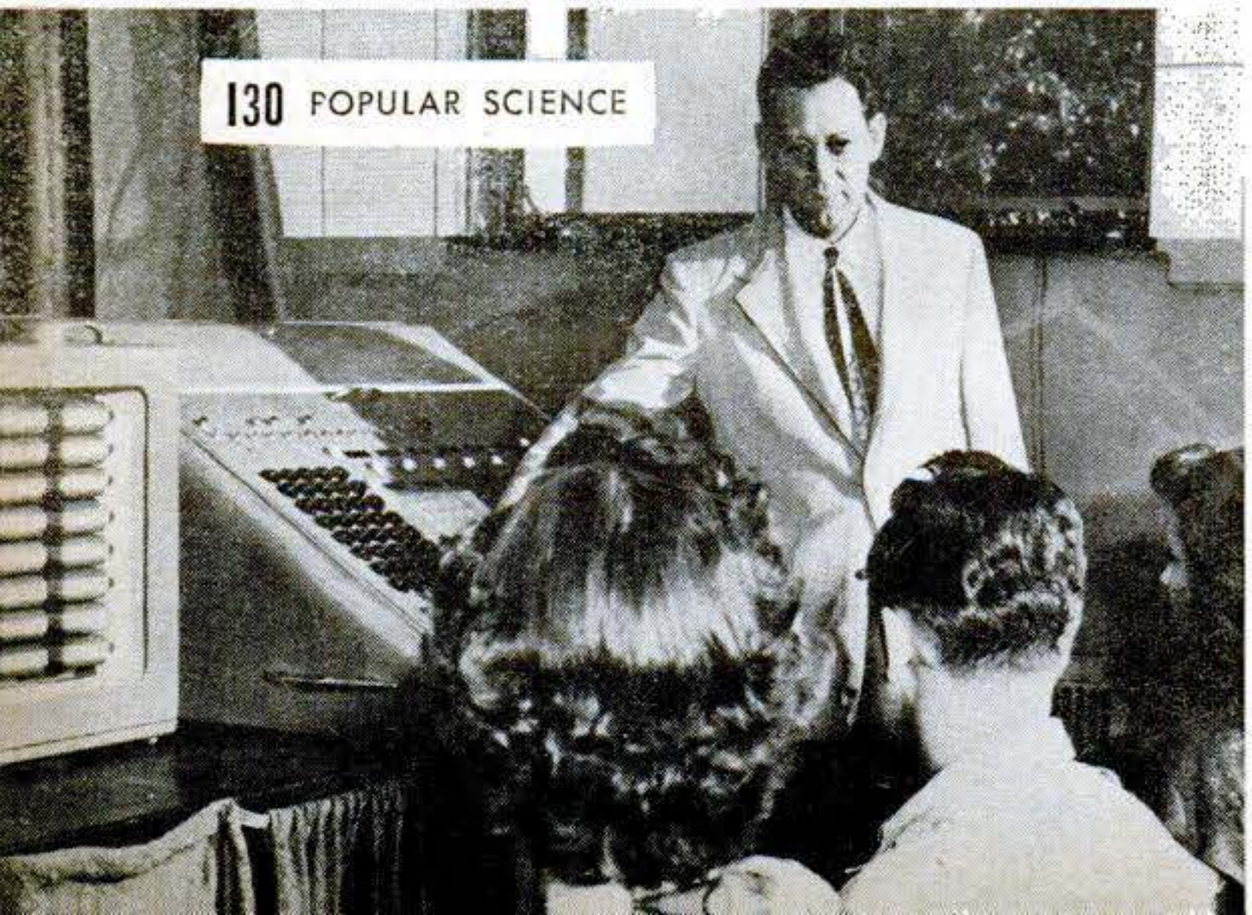
If the anti-roll tanks prove successful, they will be built into ships' hulls rather than mounted outside as on the *Peregrine*.

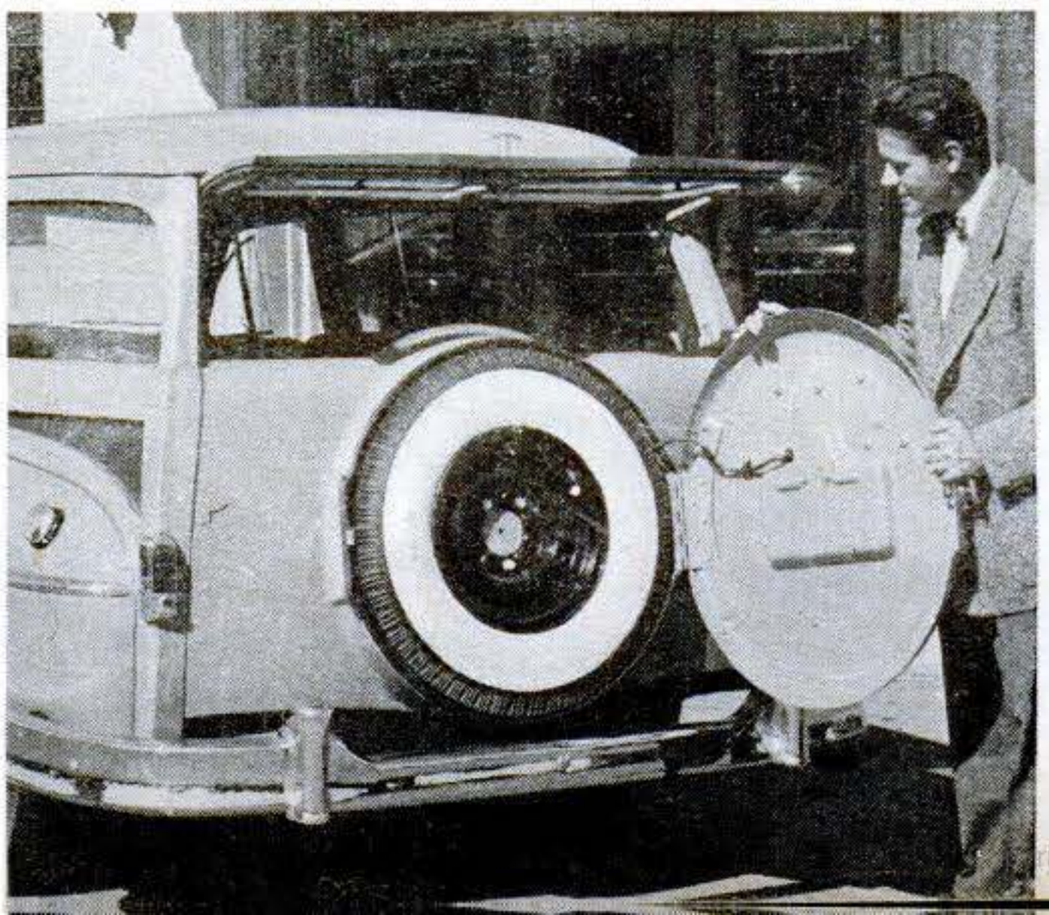
Robot Marks Exams

WHEN the Penn State professor below asks a question, each student answers by punching one of five keys on his desk. The panel flashes the correct answer by number, scores each student, shows class's percentage of right answers, and keeps a record.

Spare Tire Housed Snugly

A COMPARTMENT built into the tailgate of Chrysler's first postwar station wagon houses the spare wheel. Stoplight and license-plate bracket are mounted on the cover. The body has wood trim on steel panels photographically grained to resemble mahogany.





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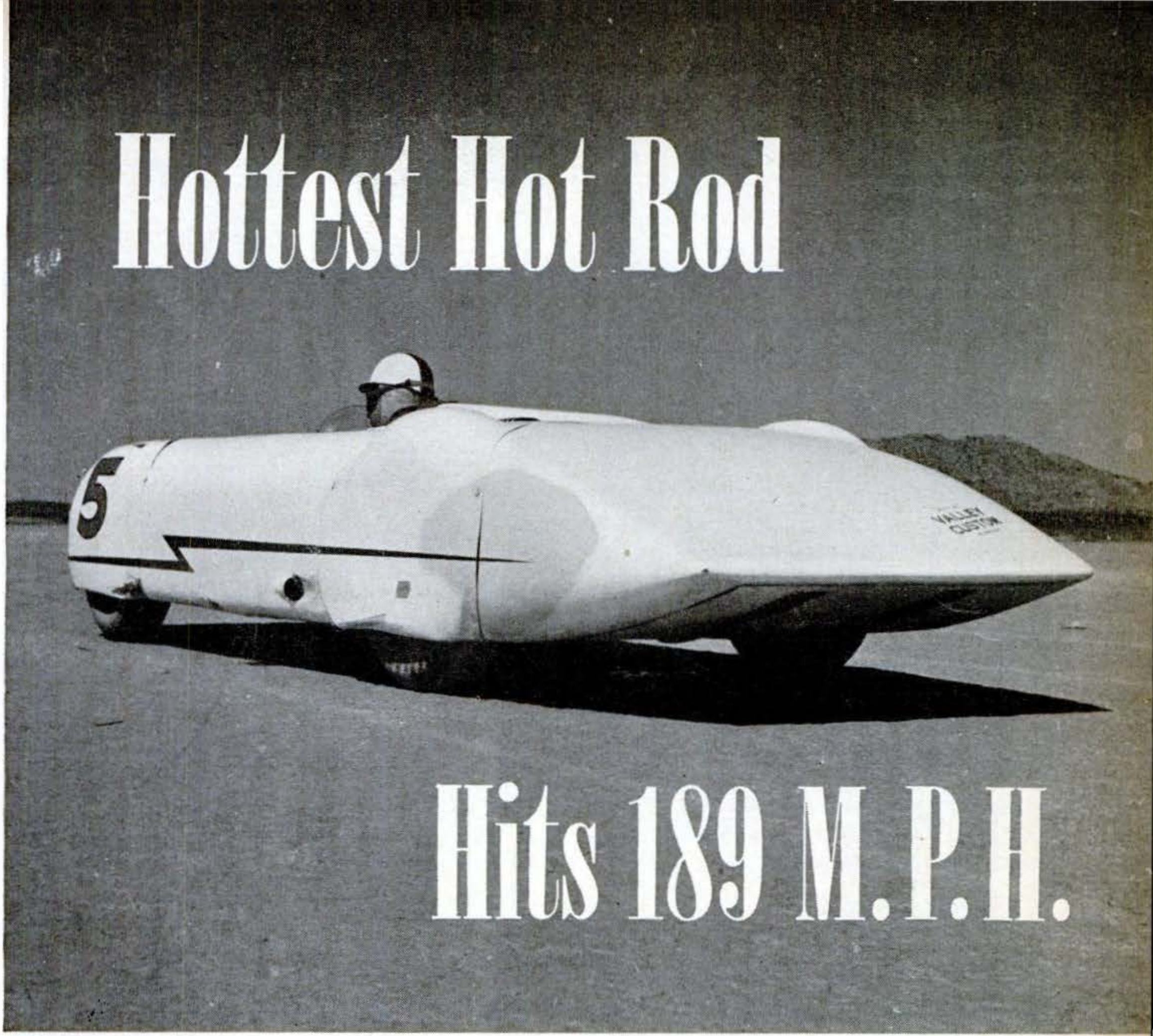
Hottest Hot Rod



Hits 189 M.P.H.

Aluminum body tapers to a line in rear. Car is only 30 inches high, excluding the headrest.

Put together out of souped-up stock-car parts, homemade speedster packs 225 hp. within its streamlined body.

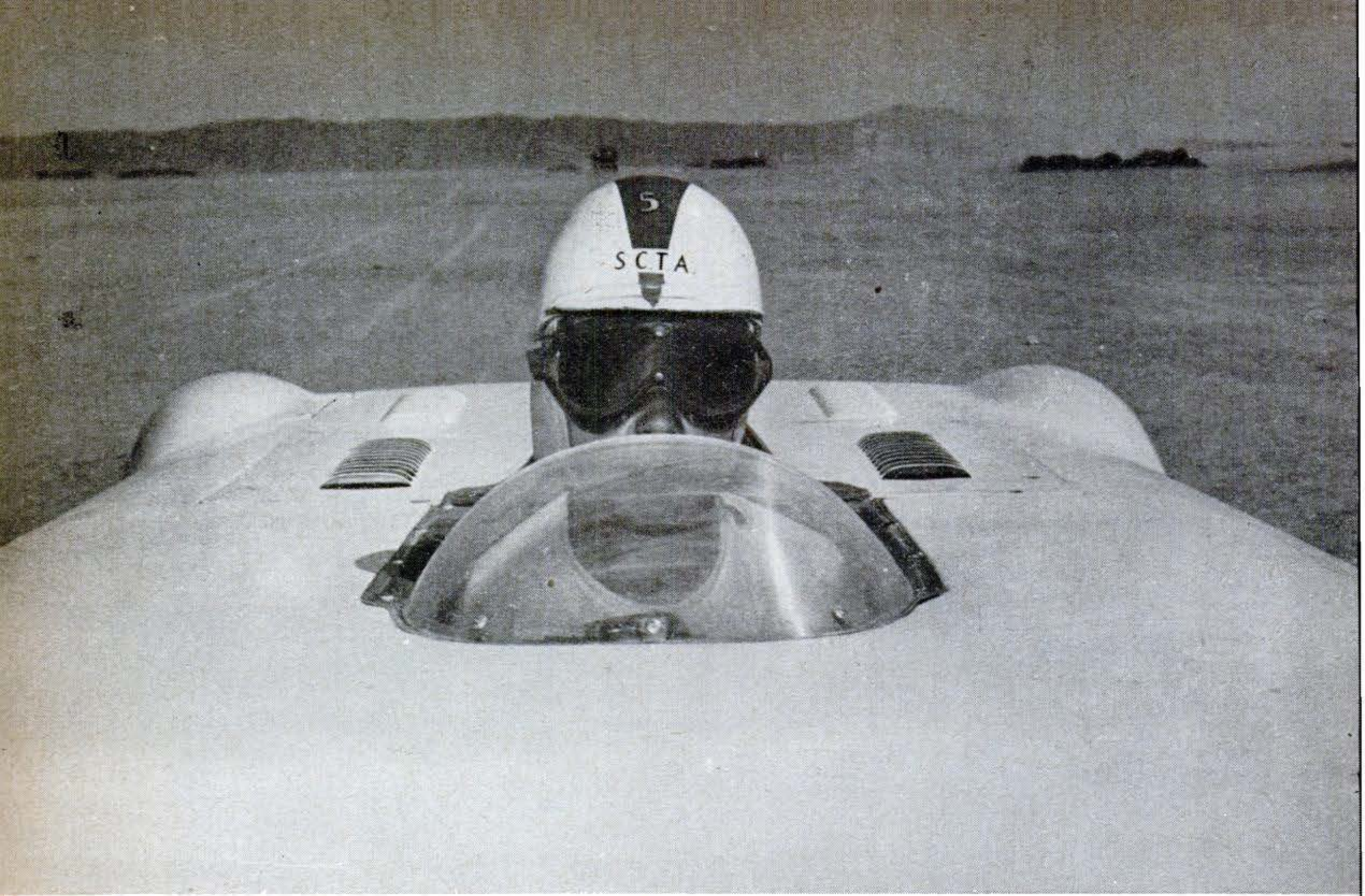
By Andrew R. Boone

THIS beautifully streamlined hot rod is the closest relative of a racing plane yet to try for speed records. Its clean aluminum body is virtually an airfoil "set in neutral"; air rushing past neither gives it a dangerous, ballooning lift nor presses it down against the ground to waste power.

Prosaically dubbed No. 5, the slick little racer has already established two sensational U.S. records. Powered with a Ford V-8 60 engine (originally a 60-hp. job built in 1939), the car was officially clocked at 156.39 m.p.h. Then it was fitted with a 1948 Mercury engine that pushed it along for an official 189.74 m.p.h. Both records are two-way averages clocked in a mile-long time trap on Utah's Bonneville salt flats. Now the designers and builders of No. 5—Alex Xydias and Dean Batchelor, of Burbank, Calif.—plan to shoot for an even 200 m.p.h.

With its symmetrical body and gold-and-white paint job, No. 5 looks totally unlike the hundreds of other home-assembled, souped-up stock cars that race against time ➧

Control wheel from a P-38 steers the car. Dash instruments show engine speed, oil pressure, fuel pressure, and water temperature in each of two cooling tanks. The car has no radiator.



At full speed, driver sits even lower than above so only his helmet top is above windshield.

on desert straightaways. Its slick aluminum body, formed over three bulkheads, was designed by Xydias and Batchelor after consulting Lockheed aircraft engineers for a shape that would have minimum air resistance and "neutral" airfoil section. The car stands only 30 inches high and is five feet wide. Its over-all length is 15 feet, with an eight-foot wheelbase. Its tread is 48 inches in front, 49 in back. With the heavier Mercury engine, it weighs only 1,500 pounds.

Like its plainer hot-rod brothers, No. 5 is a curious compound of stock-car parts spiced with high-performance and aircraft components. The front axle and springs are from a Model-A Ford. The steering column and gear first saw service on a 1932 Ford. On No. 5 they're mounted in a position rotated 90° from the original so as to give added road clearance. There are no rear springs; the axle is bolted solidly to frame members from an ancient Ford Model T.

The Mercury engine has a racing camshaft, special domed pistons, and a pair of high-compression cylinderheads. Three carburetors feed into a special intake manifold. At the record speed, the Mercury turned up to 5,400 r.p.m. and delivered better than 225 hp. The smaller Ford 60, similarly modified except that it has two carburetors instead of three, wound up to 6,200 r.p.m. and put out an estimated 130 hp.

A pair of eight-gal. tanks that once carried de-icing fluid in a bomber feed cooling water to the engine. Peak engine temperature in speed runs is around 190° F.

Another small tank just behind the engine carries 3.7 gallons of methyl alcohol fuel, which is barely enough to drive the car eight miles at top speed. The alcohol is fed to the carburetors by hand-pumped air pressure.

A special ball-bearing rear axle permits easy changing of the engine-to-wheel ratio, depending on which power plant is used. The Ford engine works through a ratio of 3.48 to 1; the Mercury drives it at 2.52 to 1. The engine is coupled to the rear end by a drive shaft 10 inches long, which—since the rear axle is unsprung—needs no universal.

Crouched down in a bucket seat salvaged from a fighter plane, No. 5's driver has a minimum of instruments and controls to steal his attention. A foot accelerator, a brake pedal, and the steering wheel are all that he need concern himself with during his flashing run along the electrically timed mile.

If No. 5 ever hits 200 m.p.h., it's likely Batchelor will be at the wheel. Xydias' wife recently presented him with a child. Batchelor—you guessed it—is a batchelor. END

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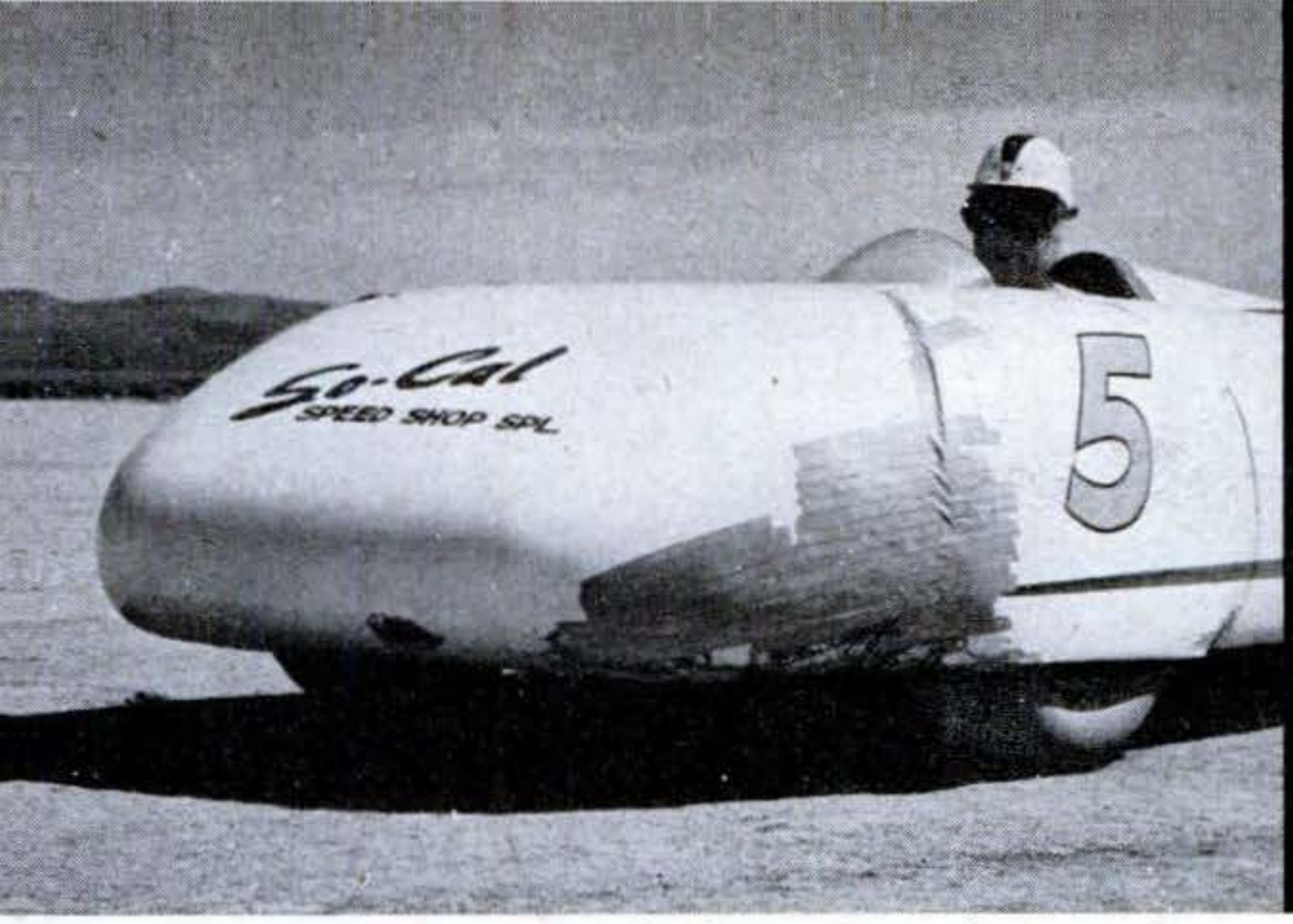
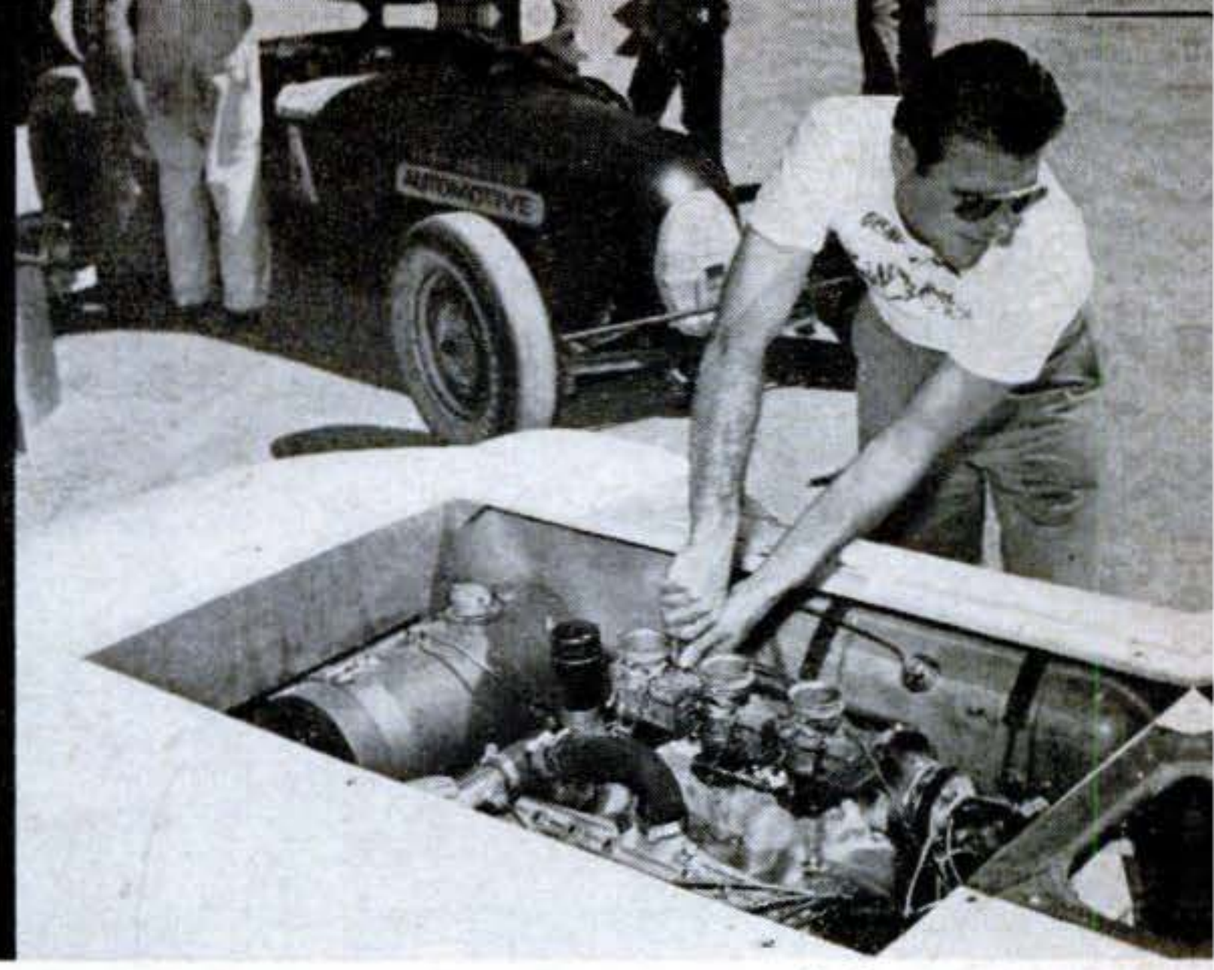
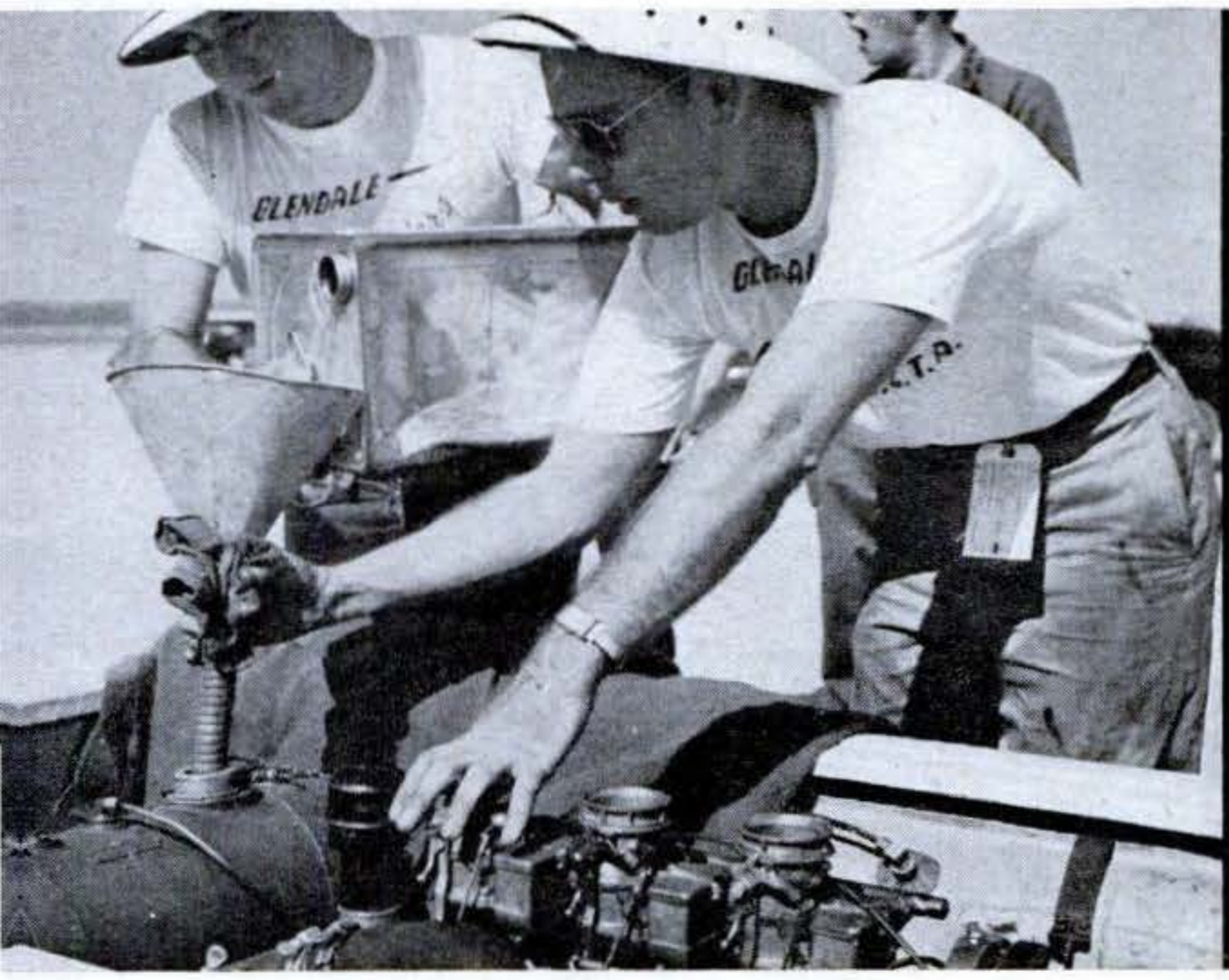


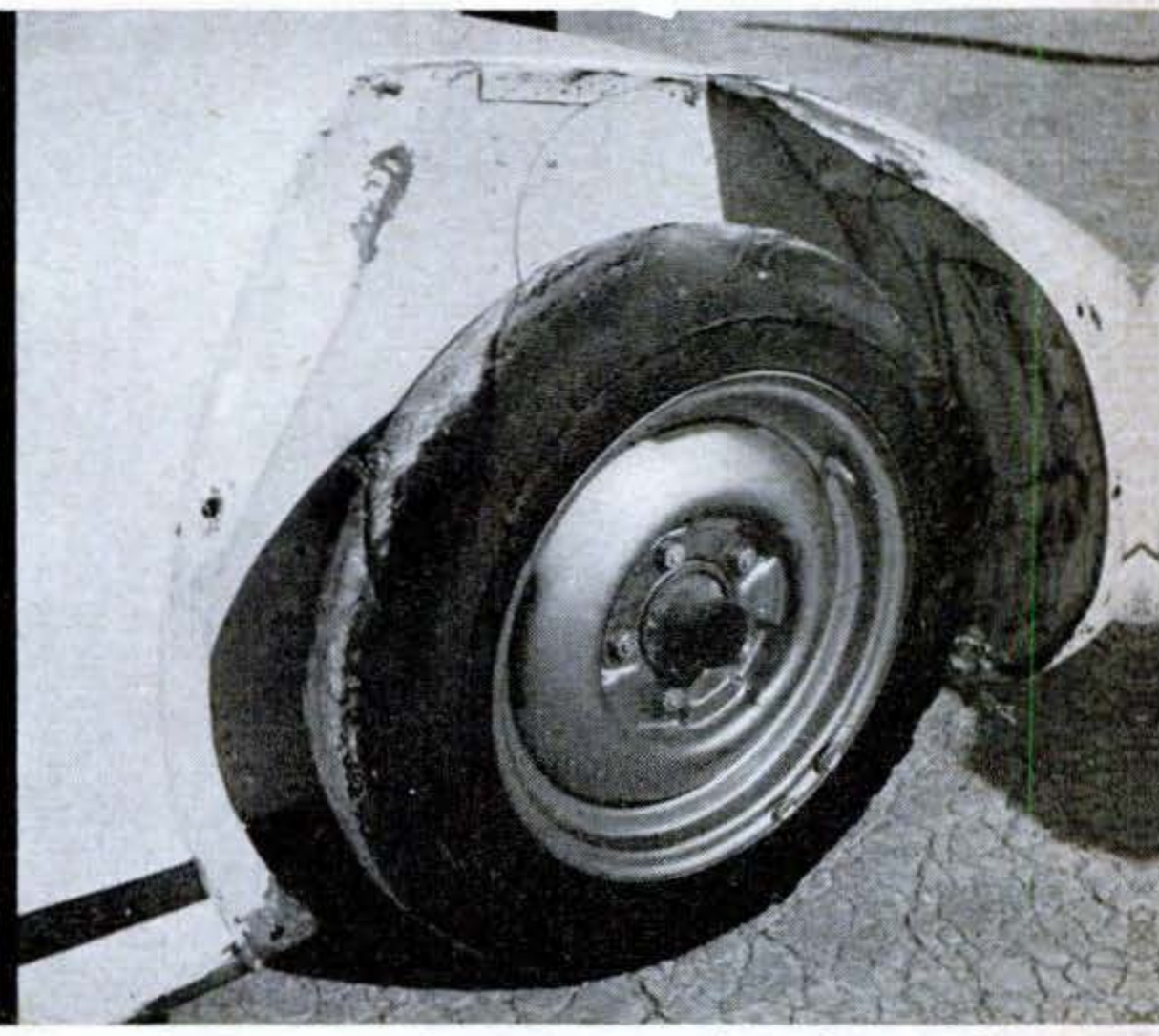
Masking tape on leading edges of wheel skirts is safety precaution. Builders of the car feared that without it, air pressure might build up enough to tear off the skirts at high speed.



Alex Xydias sets the idle on one of three carburetors used with the Mercury engine. Tank at the rear holds fuel; the long tank at the side is one of the two that hold cooling water.



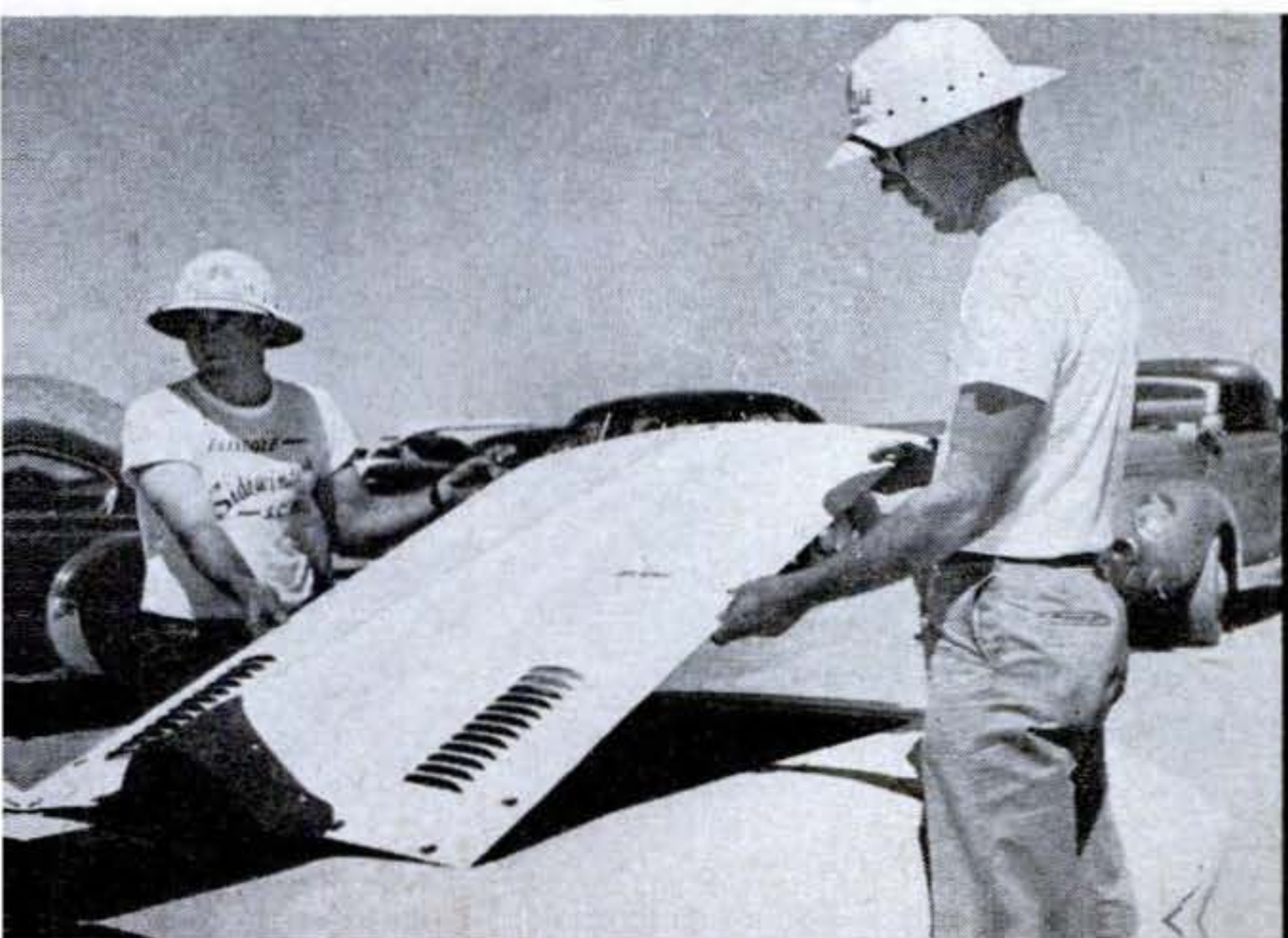
Methyl alcohol fuel is poured in by Xydias as Dean Batchelor holds funnel. Hand pump on dash feeds fuel to engine. At high speed, engine consumes about a gallon of fuel every two miles.



On salt-flat speed runs, regular dirt-track tires tended to shed their treads. The car is now equipped with thin-tread, Indianapolis-type tires. Size is 7.00 by 16 for all four wheels.

Engine-compartment cover carries faired-in headrest. Louvers shown aid in cooling engine and in feeding air to carburetors. Leading edge of cover is also taped before speed runs.

Pointed rear of the hot rod's body is beefed up with horizontal tube inside to withstand pushing stresses. Car has no starter and is nudged with stock car to get engine going.



For a Safe and Sane Christmas

THE evergreen tree is a symbol of the Christmas spirit—and also the readiest source of Yuletide fires. As it dries out, it becomes tinder. Its pitch and resins can burn furiously. Here are some tips on making your tree fire-safe, with others on common causes of fires at Christmas. As the Fire Underwriters say, "don't let Santa come on a fire engine."

Use a "live" tree, not one that is dry and tindery. Then chop some cuts in the butt end and keep it in a pail of water.

Electric trains are a potential source of fire around tree because of sparks. Set yours up at a distance from the tree.

Replace frayed electric cords used to string lights on tree. Incidentally, *never* use candles except on dining table.

Curtains will catch fire more easily than you think. If you use window lights, hold curtains away with tiebacks.

Gauzy costumes and dresses can be made flame-resistant by dipping in 9 oz. borax, 4 oz. boric acid, 1 gal. water.

Christmas wrappings are a ready source of fire. Once presents are unwrapped, dispose of paper immediately.

Watch that overload on your house circuits. It's a good idea to make a thorough check of your fuse boxes, too.

Those cute toys run by alcohol flame or other flammable liquids are for the older boy, not the careless youngster.

Aluminum foil is a good fire-preventer. Spread around base of tree, it will protect floor and lessen fire danger.

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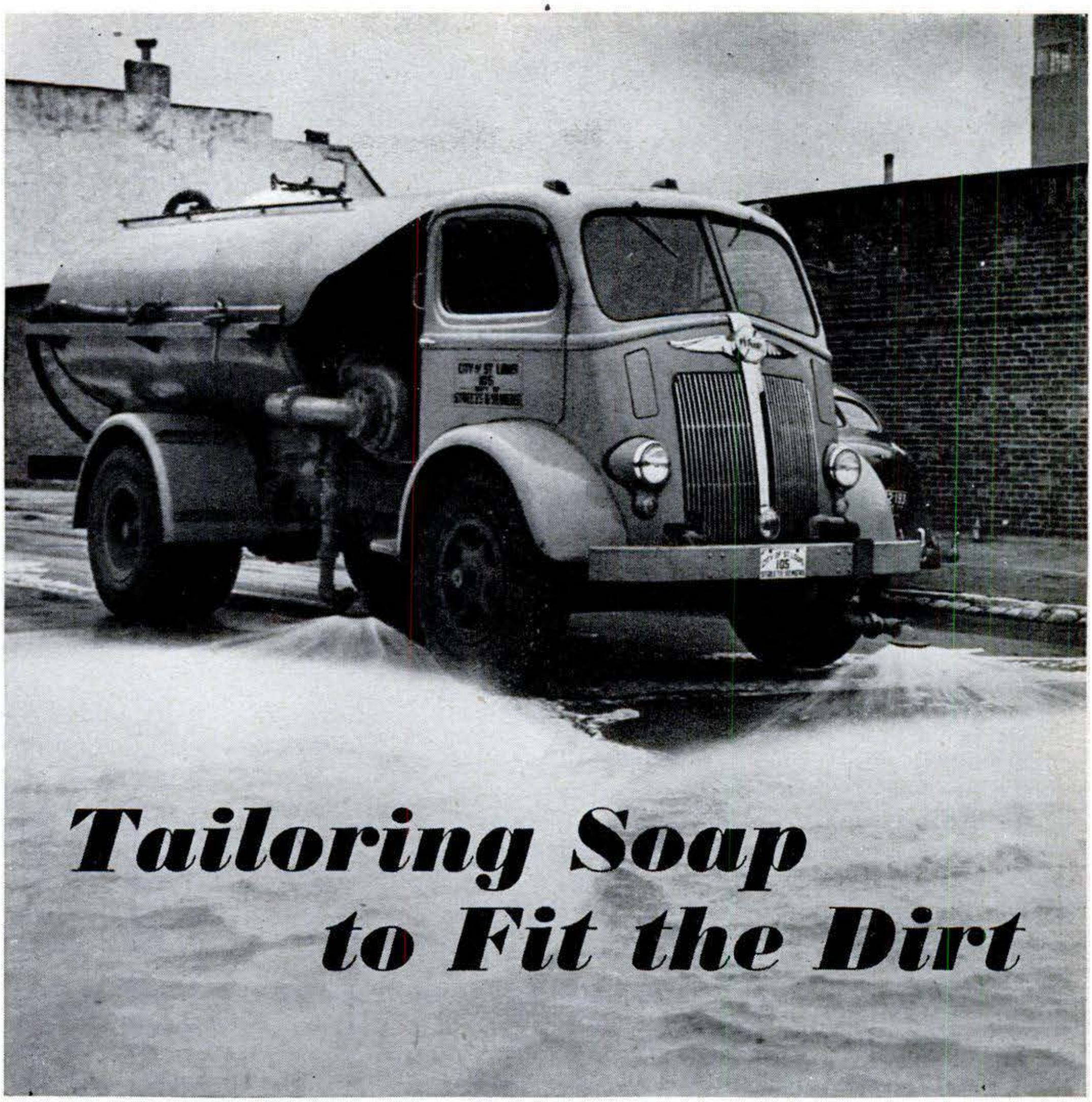

Tailoring Soap to Fit the Dirt

Skids are less likely in St. Louis—oil is being washed off streets with Monsanto's Santomerse®

New synthetic detergents clean everything from streets to teeth, and work well in any kind of water.

By Martin Mann

TWO five-dollar words describe the cleanest thing that has happened to the world in a long time: "synthetic detergent." These new chemicals look like soap and act something like soap. But they aren't soap. And they tackle jobs soap can't attempt.

One kind, claims its maker, will wash dirt off a car without removing the wax underneath. Another cleaned radioactive dust off planes used in the Eniwetok A-bomb tests. And still others remove grease from city streets, launder railroad engines, take out spots for dry cleaners, soften apple peel so it slips right off the apple, and clean all kinds of metal parts and machinery. Some motor oils contain detergents to keep sludge in suspension, reducing engine wear. In the home, they are found in everything from the toilet bar that leaves no ring around the bathtub to powders that clean dishes remarkably fast, even in hard water.

Synthetic detergents, almost unknown before the war but now accounting for about a sixth of all "soap" sold, are not made from tallow, like real soap, but mainly from petroleum. Chemically, they are similar to soap, consisting of "head-and-tail" molecules. The hydrophobic (water-hating) tail sinks into greasy dirt, while the hydrophilic (water-loving) head sinks into

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water. Thus the detergent surrounds a dirt particle so that it can be carried away by the water. Soap works the same way.

Yet detergent molecules are not the same type as soap molecules. This is one of their main advantages. Soap reacts with the minerals in hard water to form a scum that settles out—the bathtub ring. And of course the soap that has gone into the scum is completely wasted. Detergents ignore the hard-water minerals; they work just as well whether the water is hard or soft. Thus, there can't be any scum, and no detergent is wasted.

Many of the detergents are tailor-made for particular jobs. Some are intended for heavy-duty industrial cleaning, others for washing fine silks. Still another—for automatic dishwashing machines—doesn't foam, since the suds may impede the mechanical washing action.

Tailoring detergents to do just what you want them to is simple in theory, but not so easy to carry out. The big companies use every laboratory method they can think of to make better types. They measure acidity, surface tension, dispersing power, ability to dissolve oil, affinity for the material to be cleaned, and many other factors. Yet there is only one way to make a really good final test—by using the detergent to wash things. And that becomes complicated.

She's getting that cloth dirty on purpose! "Standard soiled cotton," shown being made in Department of Agriculture laboratory, is washed to evaluate cleaning power of various synthetics.

Every Day Is Washday

At the Jersey City plant of the Colgate-Palmolive-Peet Co.—the firm that makes Vel®, Fab®, and many others—you can walk into a small room any day of the week and see a group of men staring intently at a table. There's nothing on the table but a sheet of light-gray cardboard and a few folded white towels. The men are deciding which towel looks cleanest. This is the final step in the "semi-practical" testing of new detergents.

The testing itself—mainly on household detergents, since they represent the biggest share of the business—takes place in a room looking something like a high-school chemistry laboratory that has been taken over for a kitchen-laundry by a family with 12 kids. There are the usual stone-topped laboratory counters, some chemical glassware, and several impressive instruments, obviously highly scientific. But you'll also see several home washing machines, a drier, an ironing board and electric iron, a mangle, stacks of dishes, and what looks like dirty hand towels. The place is jammed with women, all busily tending the machines as though they were expecting all dozen kids to come in demanding lunch any minute. Actually, they are busy finding out how good experimental detergents are the hard way—by using them to wash things much the same way a consumer would.

Your guide, the chief of this section and one of the few men in the room, explains what is being done. One stack of "dirty towels" is really "standard soiled cotton," swatches of good cotton cloth that have been carefully run through a mixture of motor oil and graphite. This, naturally, makes them a hopeless gray. The degree of dirtiness is measured with one of the scientific gadgets, a Hunter Reflectometer®, which has a photoelectric cell to gauge the amount of light reflected from the sample. The less light reflected, the dirtier it is.

Then the soiled cotton is washed with the experimental detergent in laboratory washing machines. One type, called a launder-

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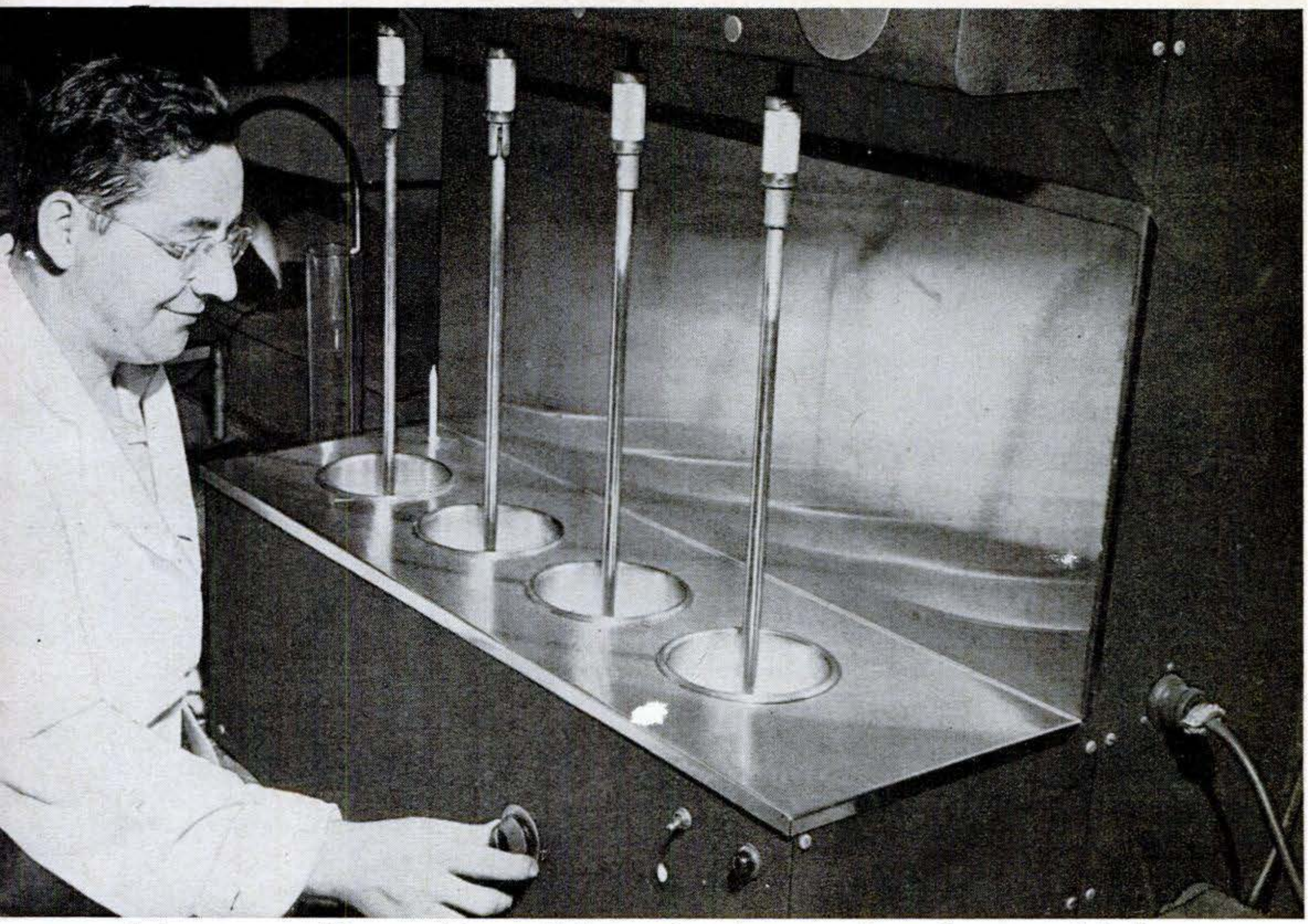

Laboratory washing machine, called Terg-O-Tometer, is used by Colgate for test-laundering four batches of standard soiled cotton at once. It is an exact copy of ordinary agitator home machine, but is scaled down in size. "Whiteness" of dirty swatches is measured before and after laundering, the change indicating the effectiveness of the formula under test.

ometer, consists simply of pint Mason jars that contain a few ball bearings and are spun on a rotating shaft. The other type, a Terg-O-Tometer®, works like a home machine, but has its tanks and agitators scaled down to 1/64th size, with the agitator speeded up accordingly. After washing, the cotton swatches are measured again in the Reflectometer—how much brighter they become tells how good that detergent is.

The other stacks of dirty towels you noticed are actually towels. Just ordinary hand towels collected from the washrooms around the plant. The ones used by office workers get only slightly soiled, but those from the boiler room are really black.

They Have to Make Water Hard

The towels are first measured in the Reflectometer, like the standard soiled cloths. Then they are washed with experimental detergents in ordinary home machines, both automatic and wringer types. The Jersey City tap water is fairly soft, so it need not be treated. But if the researchers want to know how the detergent would work in a hard-water locality, they add precisely enough minerals to the water to make it duplicate the hardness of that particular place. After the towels are dried, they are ironed by hand or machine and measured again in the Reflectometer. Then they go back to the washrooms.

The dishes? No, they don't come from a plant cafeteria. To test the dish-washing ability of new synthetics, the plates are purposely dirtied by brushing them with tallow. The amount of suds remaining in the dish pan after the dishes are clean indicates the ability of the detergent to emulsify dirt.

Even "semi-practical" tests, such as those with towels and standard cloths, don't tell the whole story. The Reflectometer only measures what *part* of the dirt was removed. And consumers don't particularly care about that. They want a detergent that removes *every last bit* of the dirt—or at least one that makes materials *look* like new.

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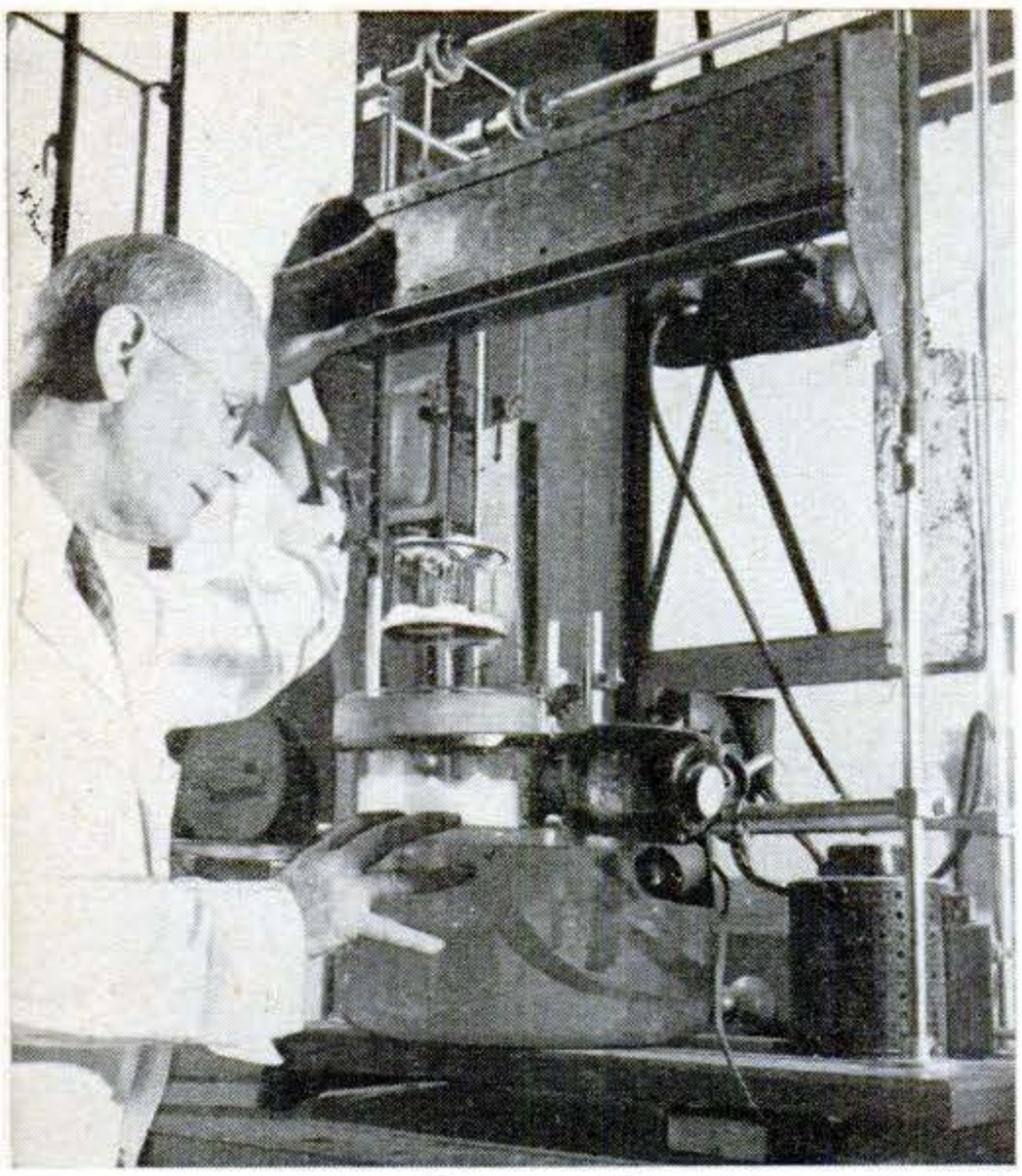
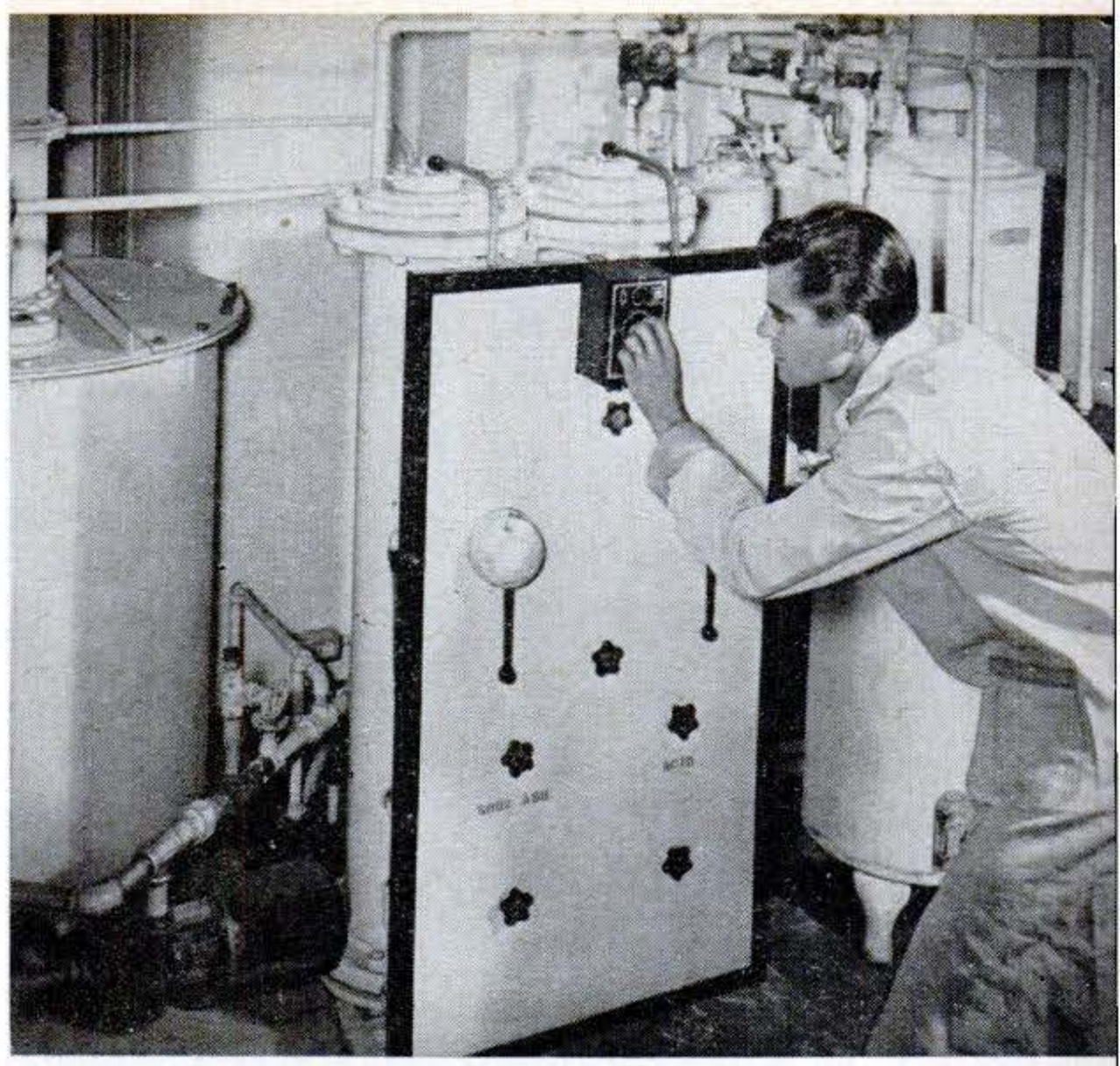


To indicate how well a new detergent will wash dishes, Colgate researcher dips greased microscope slides in beaker containing the detergent. In later tests, dishes are actually washed.



To remove minerals, water for test-washing dishes and laundry is treated in deionizer, such as one above at Economics Laboratory, Inc. Minerals can be put back to make water hard.

Nobody has yet invented a machine that tells when things look new. So this stage of testing must depend mainly on human judgment. At Colgate, these comparative checks are made by running a laundry. It's small, uses the household type of automatic machinery, and is free, but it's definitely a laundry.

Company employees bring in bundles of family wash every week. The laundry divides each bundle in half and washes each half with a different detergent. After the wash is dried and the flat work ironed, the supervisor grades the detergents on the appearance of the finished bundles. Every once in a while, the employees' wives are asked for their opinion of the results, too.

And Still More Tests

The detergent that gets this far still has a long way to go before it shouts at you from the radio, stares at you from newspaper ads, and jumps at you from grocery shelves. Colgate, like the other major producers, maintains a large "consumer panel," a group of ordinary people scattered all over the country who try out a new product in their homes and report on its performance. Following this comes the "spot tests"—limited sale to the public in a few carefully selected cities. Only when all this complex checking and rechecking assures the company executives they have something really good does it reach the general market.

Just what is it that makes a detergent good? According to many experts, there are only a few simple things a good detergent should do.

Remove dirt. The detergent must react chemically and physically with dirt, whether it's on a railroad engine, a city street, or a child's hair, so that the dirt can be shaken loose by the motion of hands or machinery. In this respect, detergents are at least equal to soaps, and, in hard, cool, or salt water, are superior.

Keep dirt suspended. Any housewife will tell you clothes can come out of a washer dirtier than they went in. The dirt was removed, but then was deposited right back on the clothes again. Real soaps excel the synthetics at keeping the dirt where it belongs, in the water.

Give plenty of suds. The bubbles are little or no help in getting things clean. In fact, they may obstruct a washer's mechanical force, which alone shakes 50 percent of the dirt loose. Yet consumers are so accustomed to suds they would be suspicious of a detergent that failed to provide them. The foam does serve a useful purpose, however, by indicating when you've used enough.

Protect fabrics and hands. Lots of things will get rid of dirt but can't be used—they

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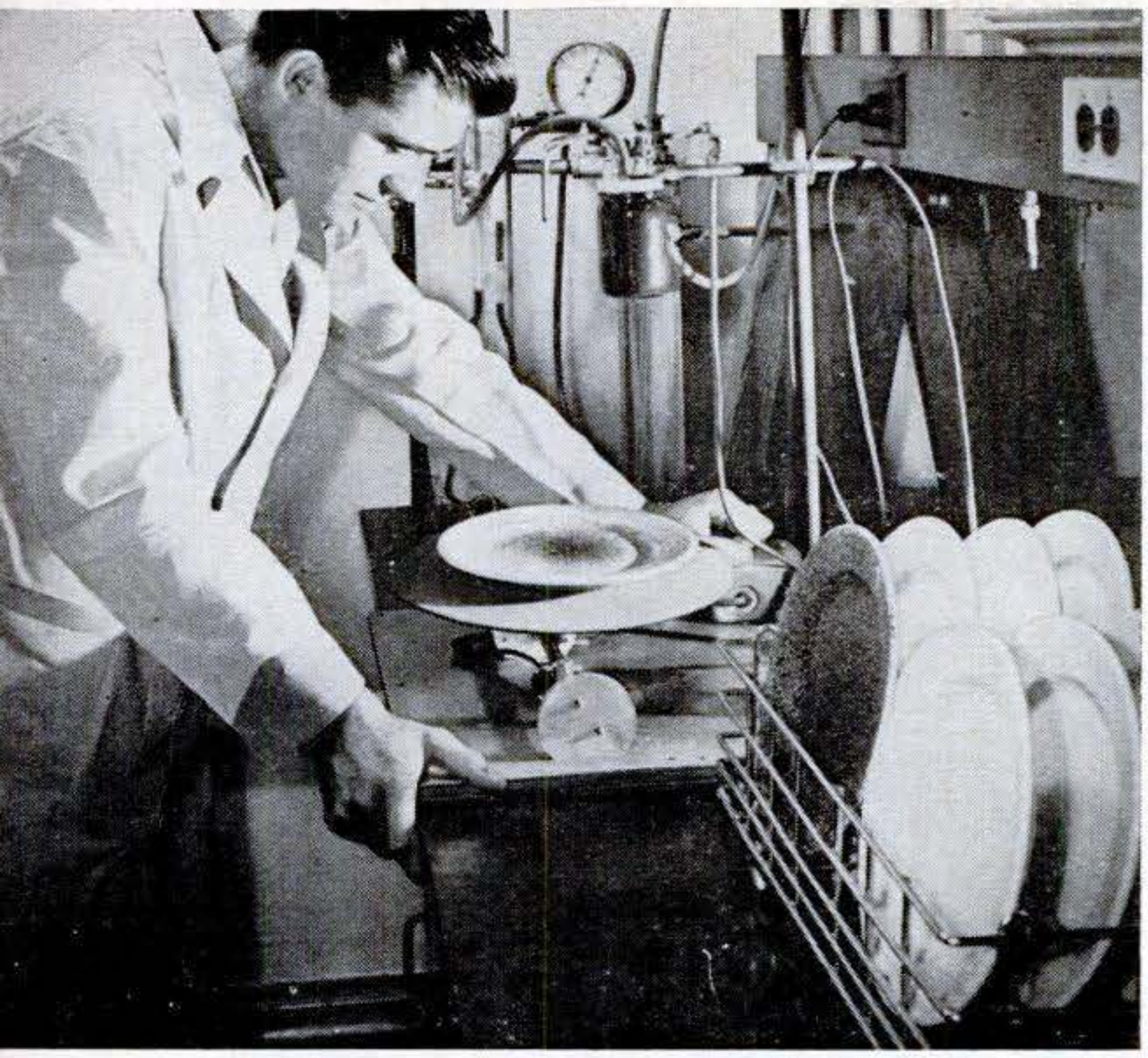
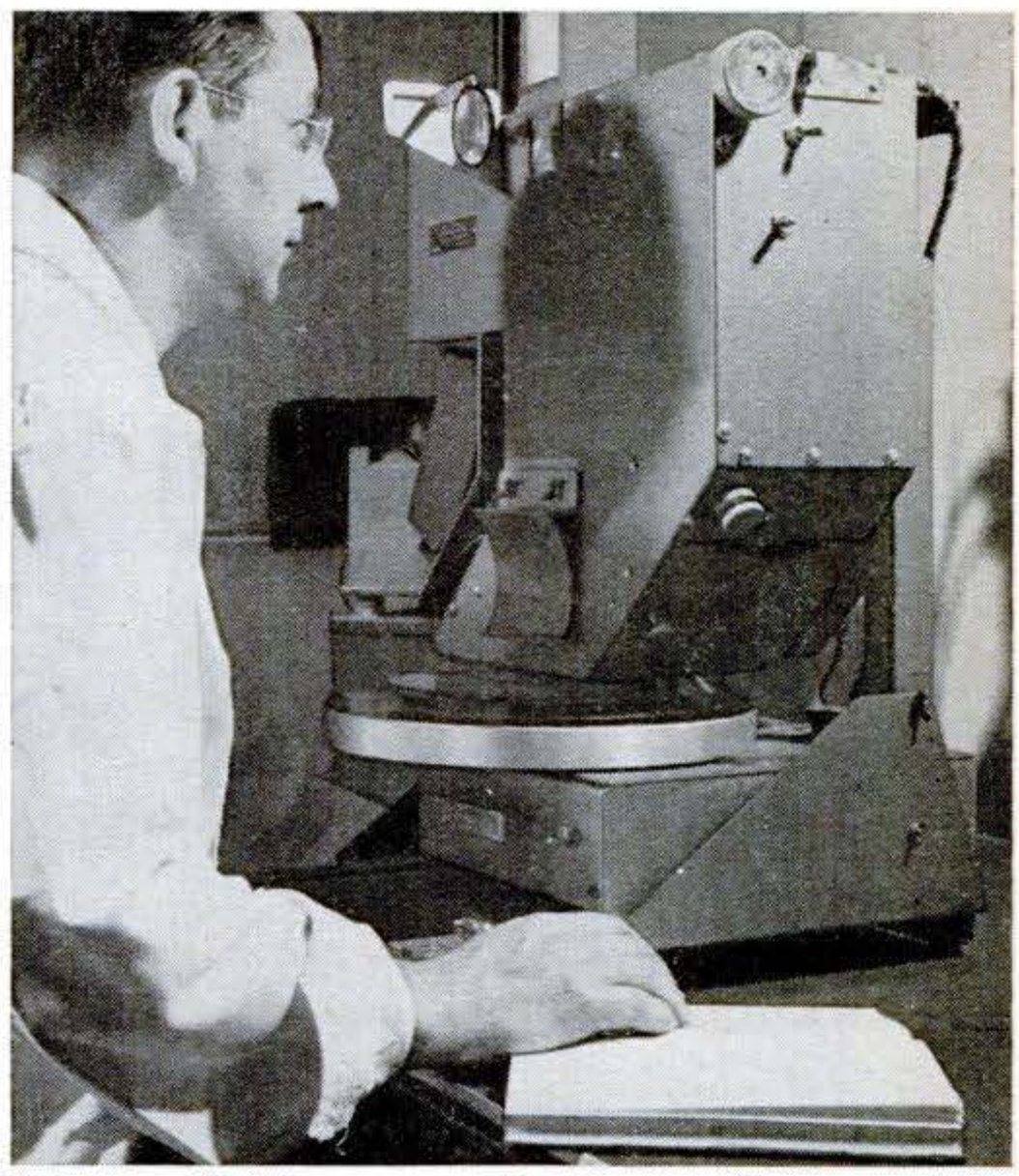


Dishes, too, must be artificially dirtied for testing detergents. At Economics Laboratory, Inc., plates are sprayed with soil, then baked. In some cases, plates are brushed with tallow.



Hunter Reflectometer®, shown above in Colgate laboratory, is widely used to measure cleanliness of cloth. It has photoelectric cell that gauges amount of light reflected by test piece.

Many of newest detergents are tailored to meet special requirements of particular washing jobs —such as cleaning dishes in an automatic washer, for which Electra-Sol® was developed.

Science, as well as the home, uses detergents. Photo above shows drone plane, contaminated with radioactive dust during Eniwetok atom-bomb tests, being washed with synthetic.

would destroy materials or cause the housewife's nightmare, "dish-pan hands." So far, any detergent that will take oil off dishes will also take oil out of the skin on human hands, making them red. But chemists have developed a cleaner that removes the dirt from metals, while leaving a protective film on the metal surface. They have hopes of making something that will do the same for hands, but they haven't found it yet.

The ideal detergent would do even more. In the words of Dr. Foster D. Snell, whose firm of consulting chemists has done much of the independent research in this field, ". . . . by mere application . . . . the soil would separate and float away." Next to inventing a way to prevent things from getting dirty in the first place, that would probably be science's greatest contribution toward a clean world. END

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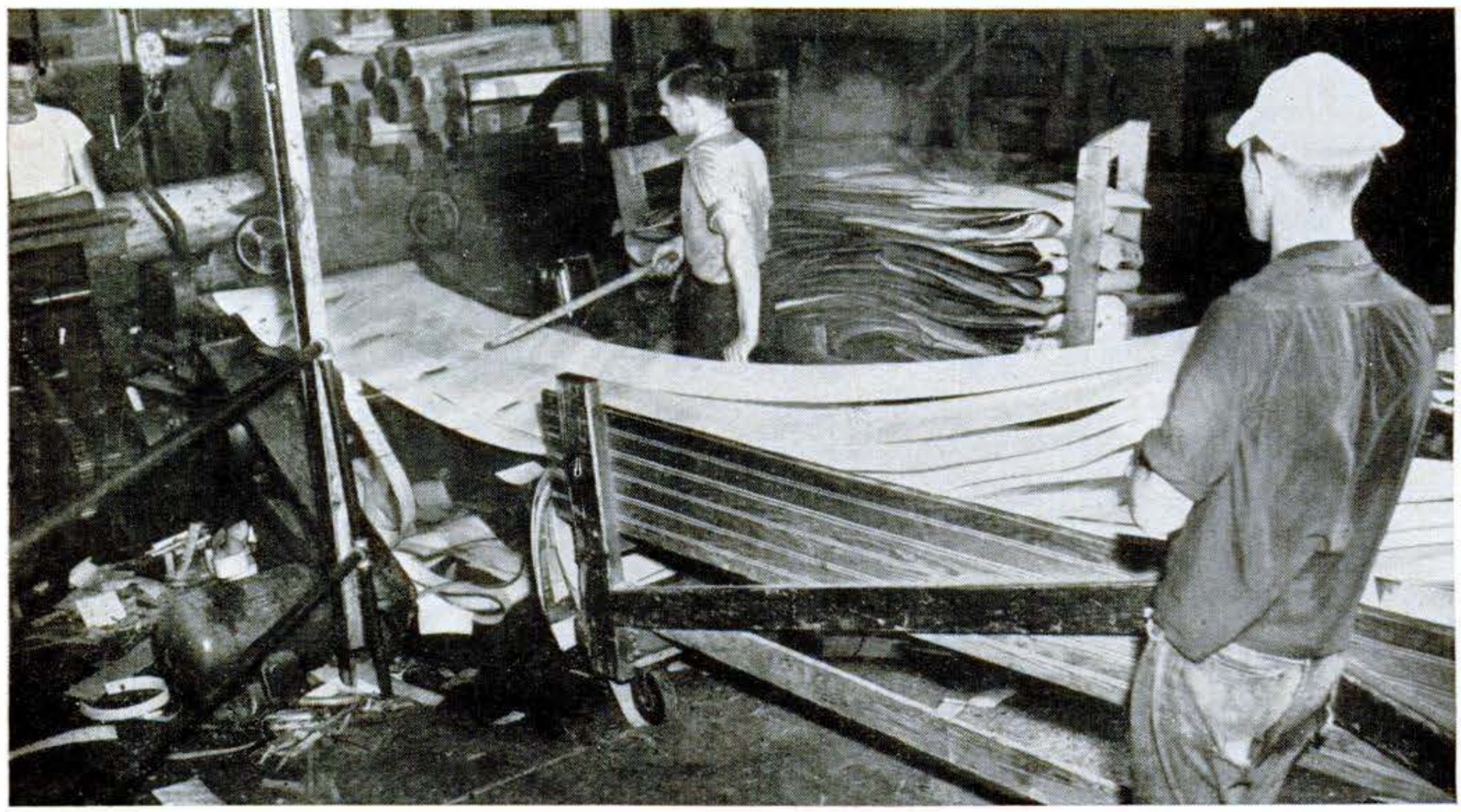
Take One Sweet-Gum Log, Boil Two Hours . . .

1 **. . . and out it comes,** ready for skinning, slicing, and stamping into ice-cream sticks, mustard paddles, and picnic spoons. This factory turns out two million such wooden articles each day. Sweet-gum logs, which peel and stamp easily, are cooked two hours at 212°. Worker at left pushes "raw" log into vat; "done" log, at right, is lifted out with tongs.



2 **After softened bark is taken off,** lathe peels and slices wood into long, thin strips. These go to machine that die-stamps desired articles. Dies can be quickly changed to turn out different items. Plant, one of only a handful like it in the U. S., has been operating little more than a year at Pomonkey, Md. It employs 70 persons, many of them women.

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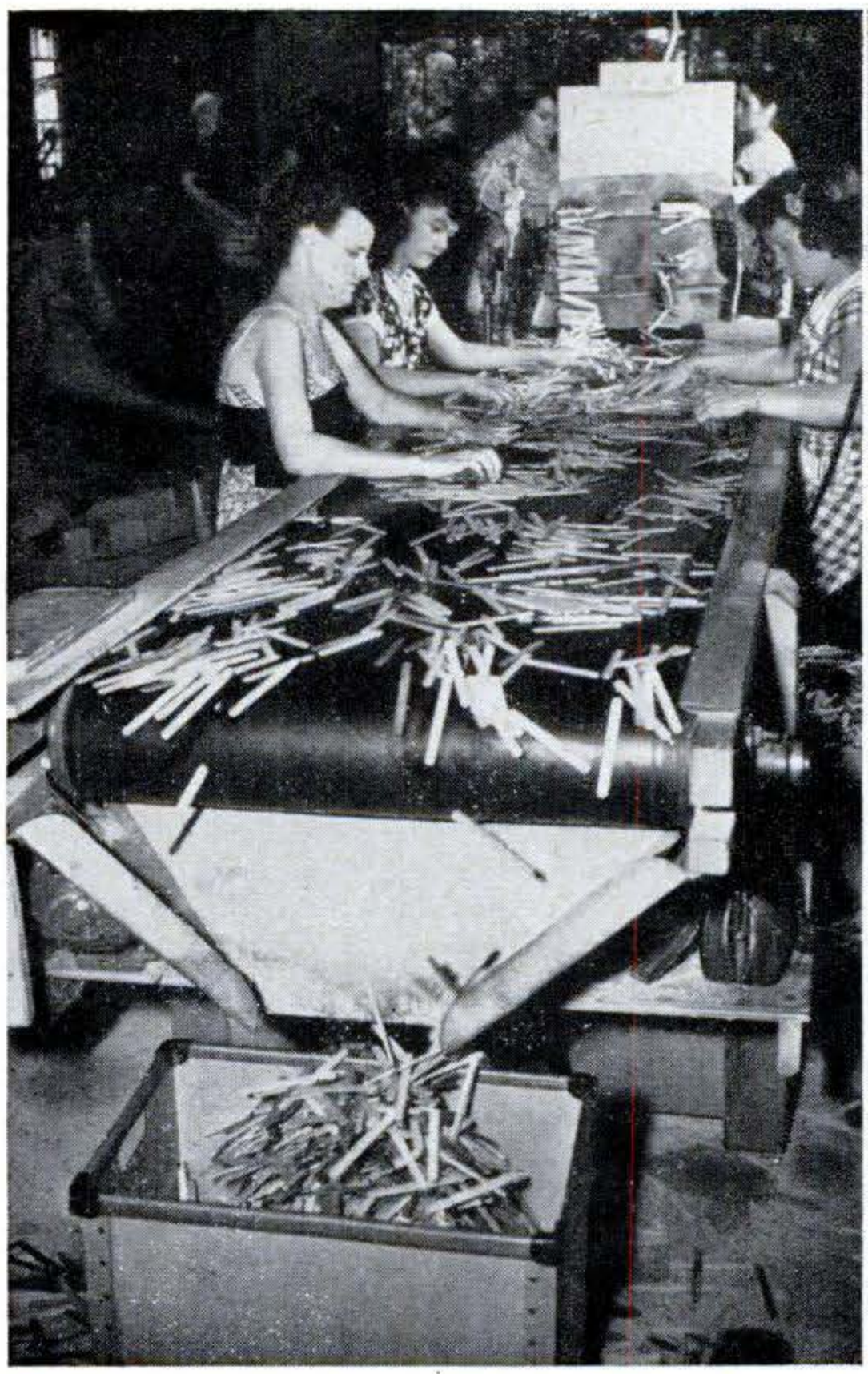

3 Pressed-out articles move from stamping machine to conveyer belt. Workers pick out defective ones, which are used to fire boilers that run the factory. These are ice-cream sticks.

4 Accepted sticks are tumbled in a drier for four hours at 200°. Factory is a one-story, cinder-block building, deep in the woods that furnish the logs that are its raw material.

5 Workers pack the sticks for shipment, 10,000 of them per carton. Factory is important to medical profession, too. One of its products is tongue depressors used by doctors.

6 Plant superintendent shows samples of day's output, each cheap enough to use once and throw away. You may be using some of them on your next picnic.

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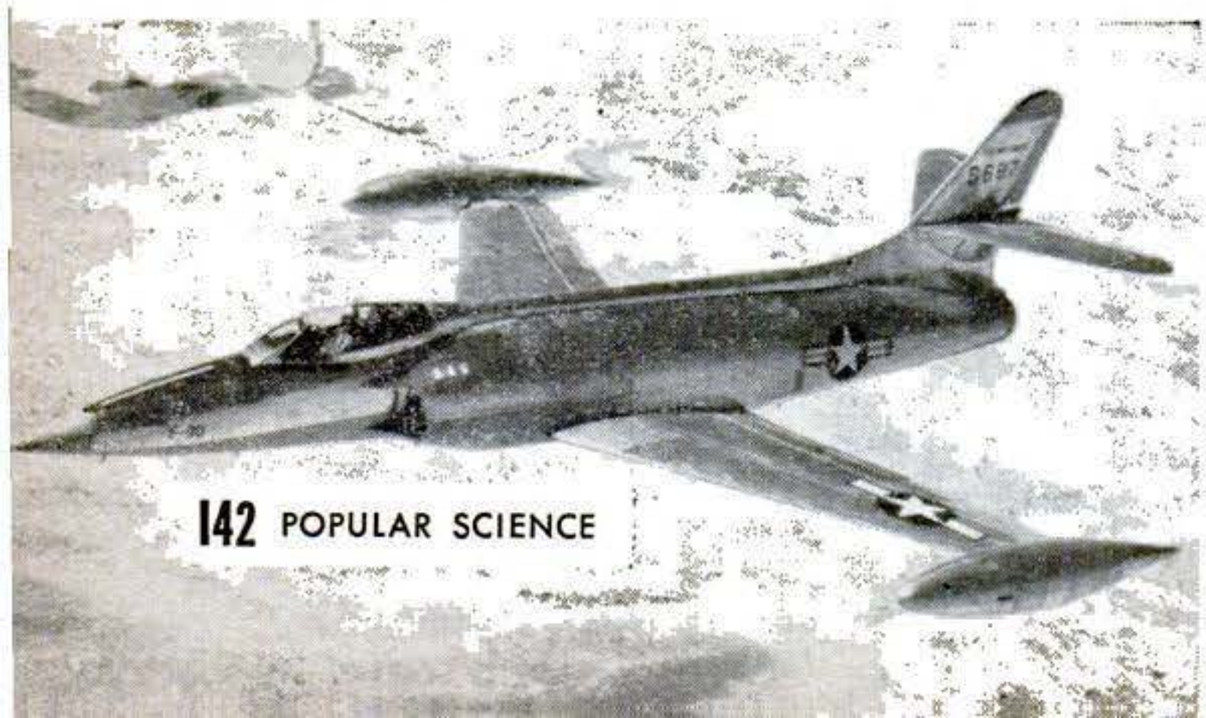
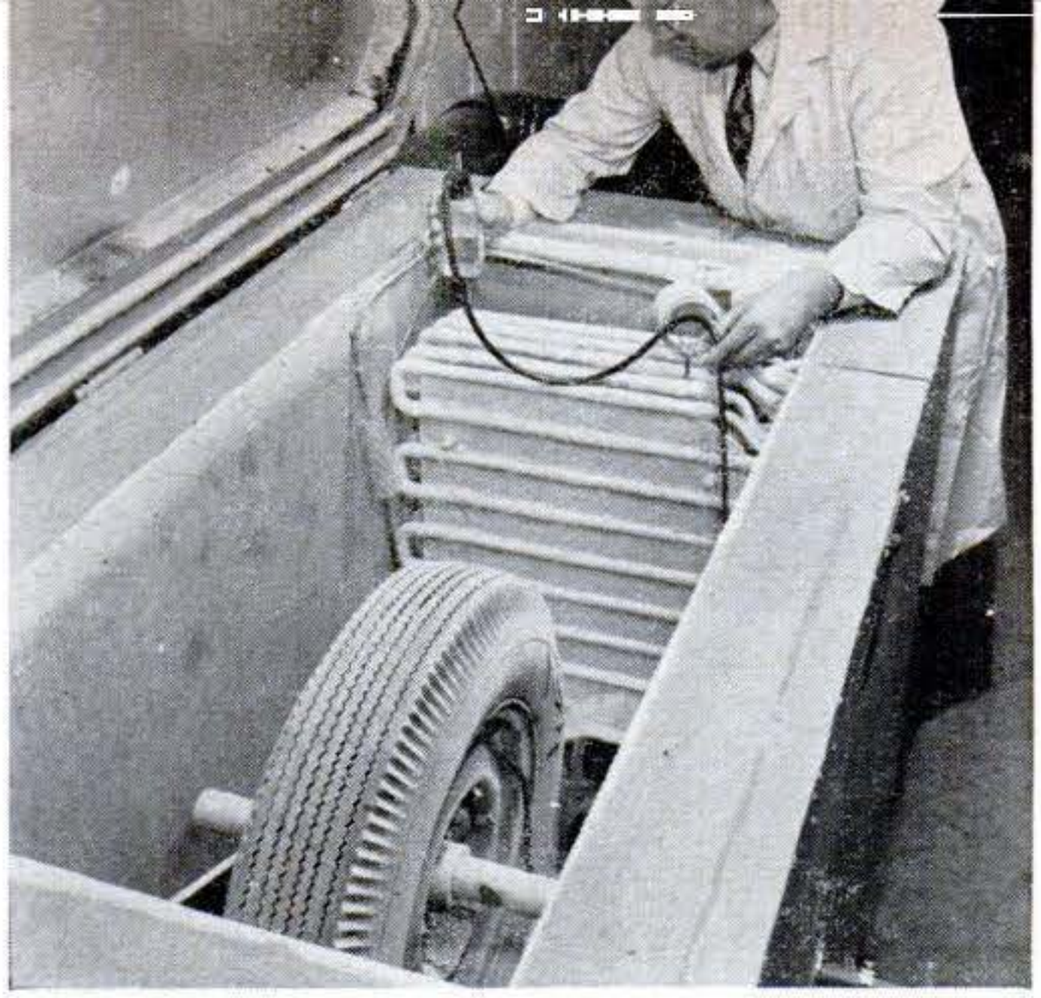
Chemistry Shines Metals

A HIGH, mirrorlike polish can now be given to many metal products by simply dipping them in a chemical bath for from 10 seconds to 10 minutes at temperatures up to 200° F. The bottom photo above shows an auto thermostat before and after dipping. At top are a variety of articles that can be chemically polished. But the new polish won't shine your pots and pans —it's for industrial use. Developed by the Battelle Institute, of Columbus, O., it is mainly phosphoric, nitric, and acetic acids.

Jet Slugger Tries Its Wings

FIRST flight photo of the Lockheed F-90 high-speed penetration fighter, over California desert, shows its needle nose and 35-degree wing sweepback. Designed for Air Force strikes at ground targets far inside enemy territory, the F-90 is built to take heavy punishment. It is powered by two Westinghouse J-34 jet engines, each delivering 3,000 pounds of thrust.



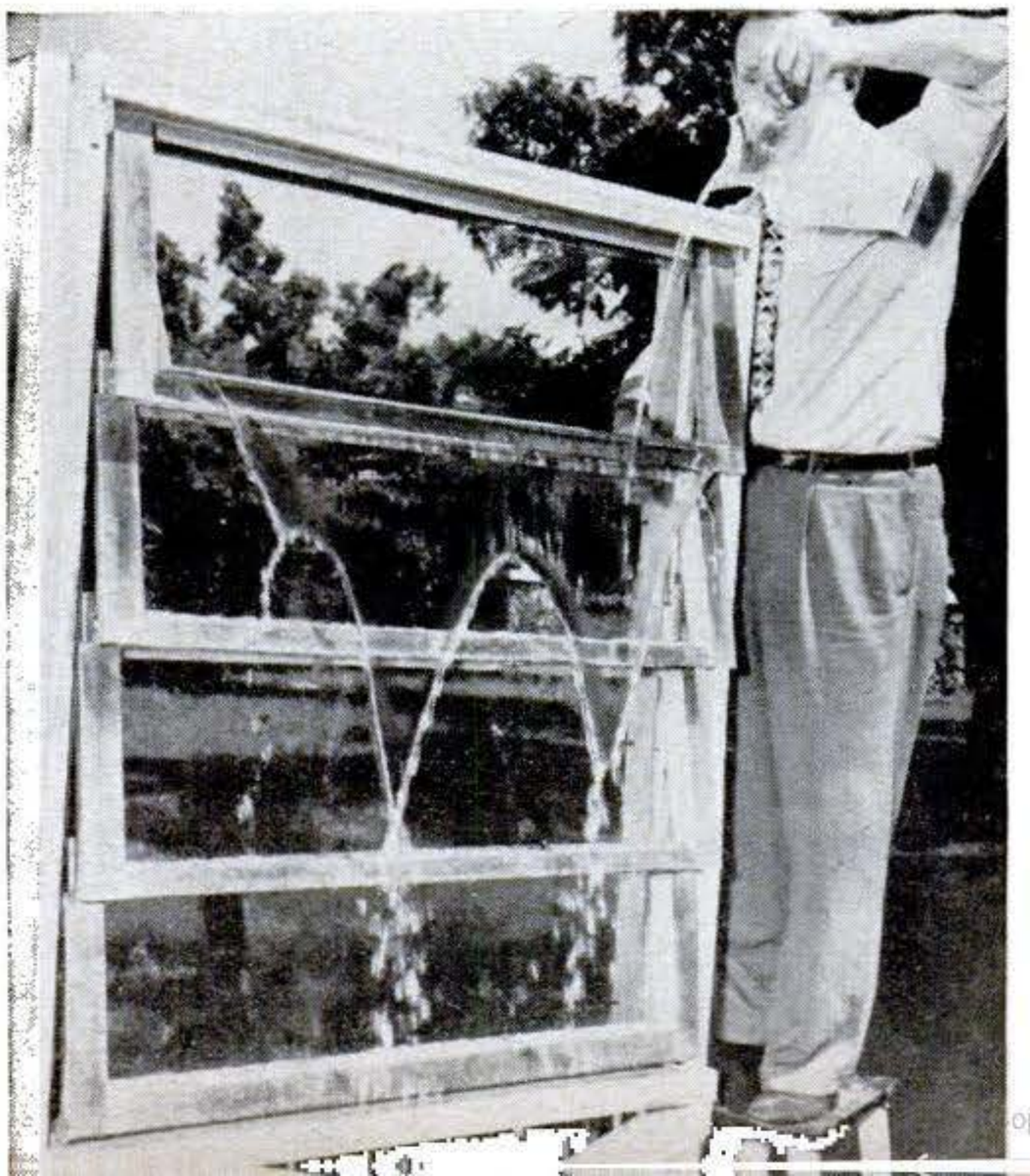


Arctic Tires Keep Bounce

THIS tire, being tested for leaks after undergoing a deep-freeze treatment at 75° below zero, is made of a new synthetic rubber polymer developed by Firestone for Arctic use. Where ordinary rubber would shatter under a blow at such low temperatures, the new product retains its resiliency. This will also permit vehicles to park in extreme subzero weather without the tires developing permanent flat spots or the treads freezing and chipping off.

Rain and Wind Close Window

EVEN with a storm approaching, you can go away and leave this window open without fear. Its inventor, Attilio Carani, of Miami, shows how rain, simulated by water poured from a pitcher, would collect in a gutter at the bottom of the top panel. Its weight, he says, starts closing this panel, and, through balances and springs, simultaneously closes the lower panels until all are shut and locked. The pressure of a wind as low as six m.p.h. would do the same.



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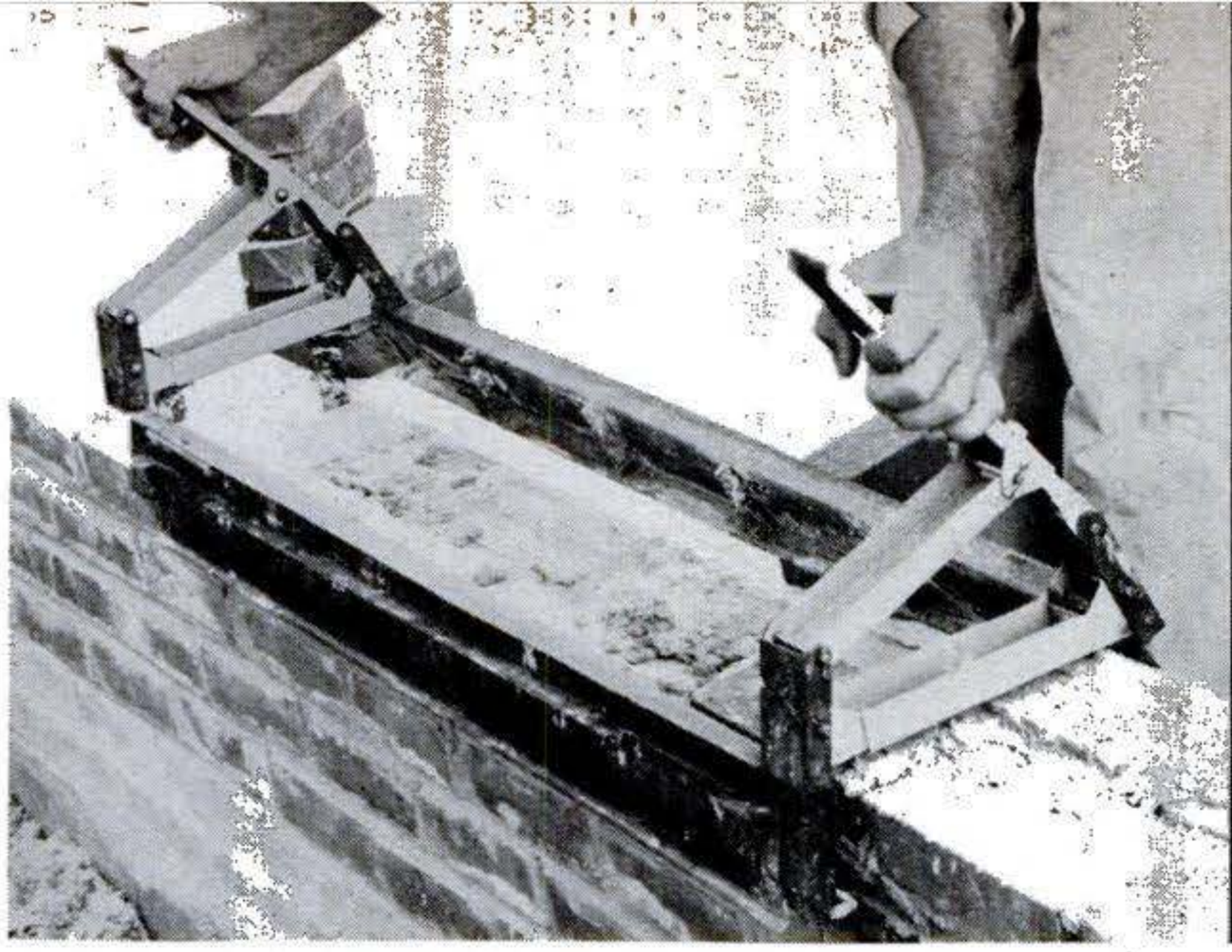
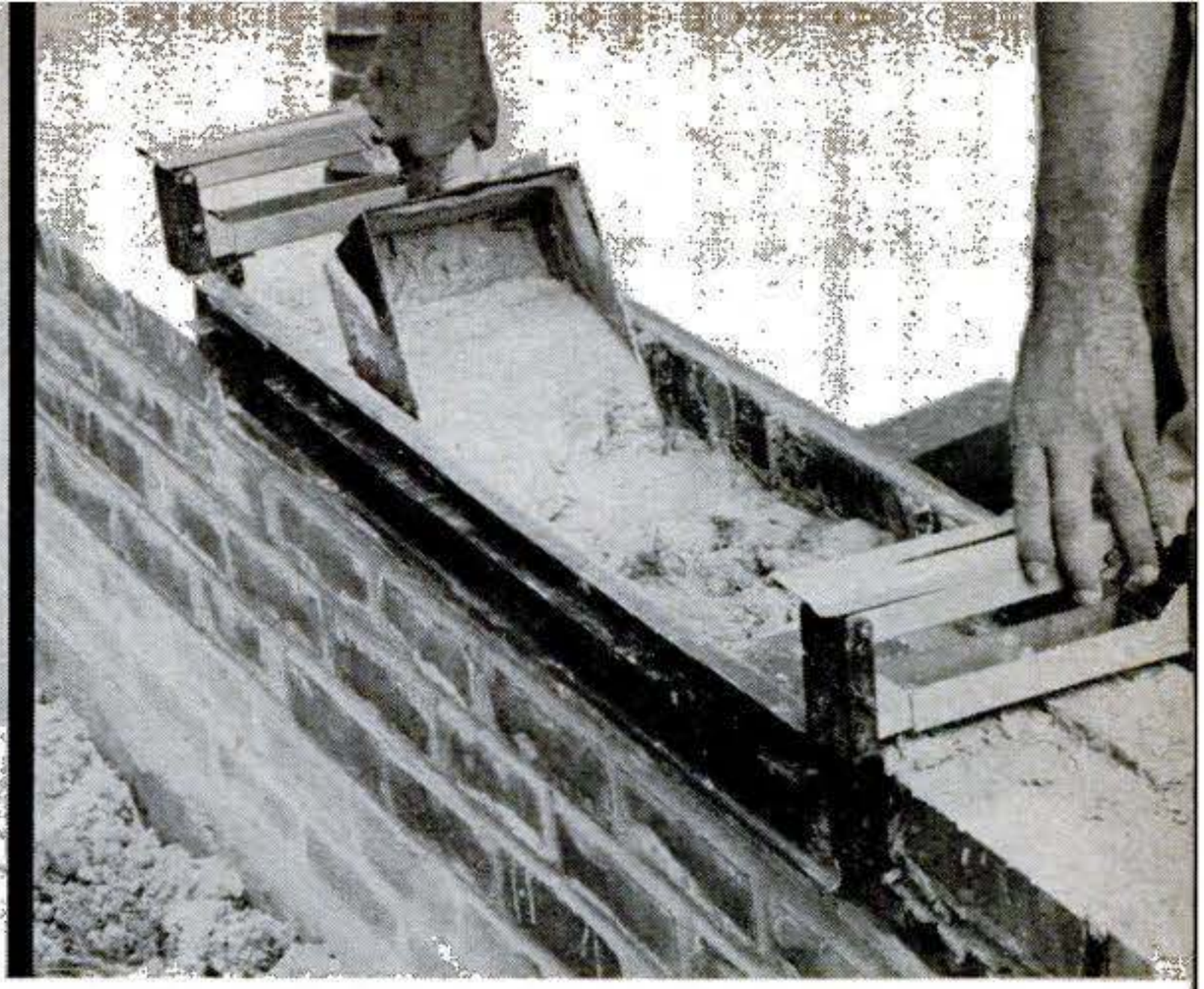
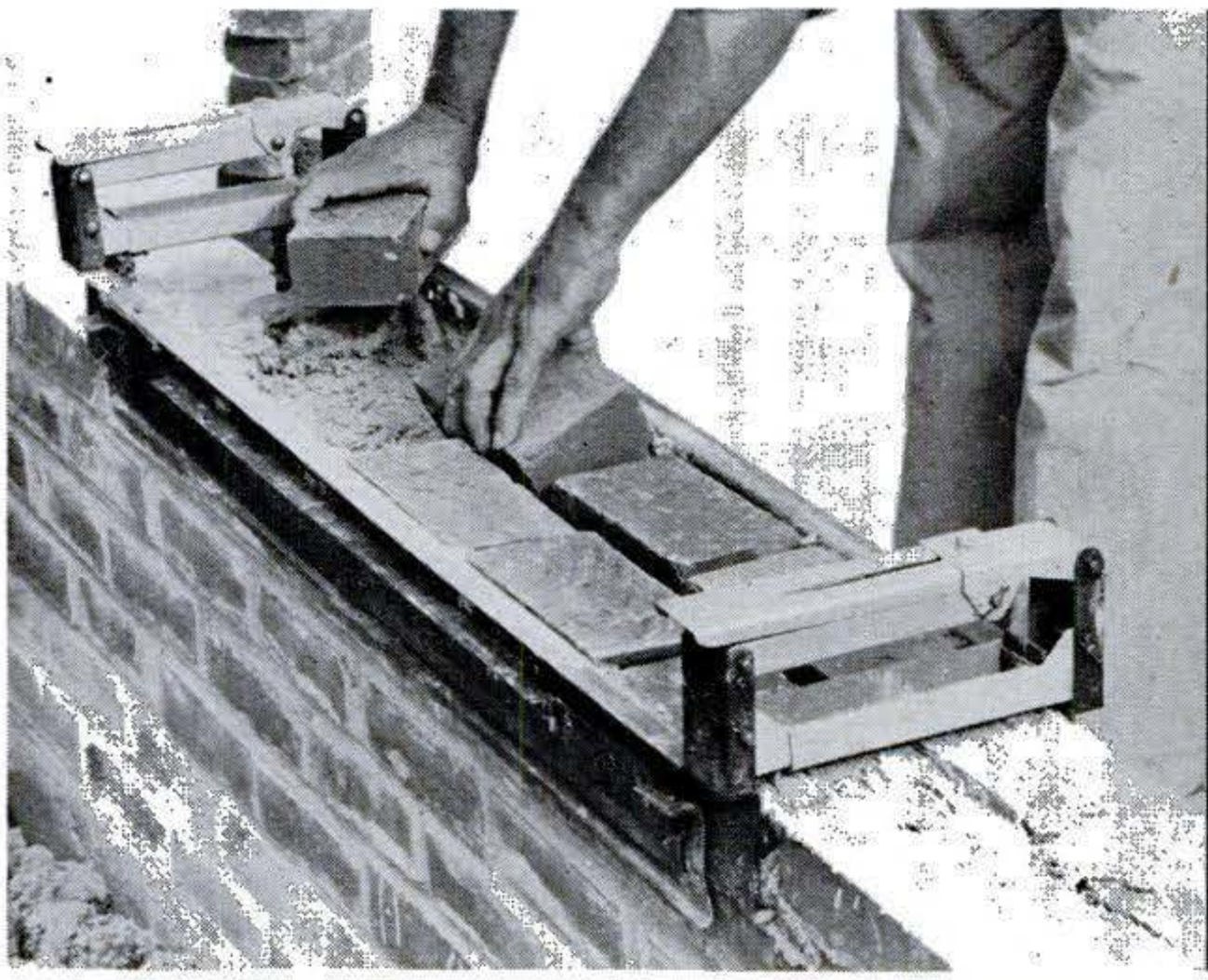


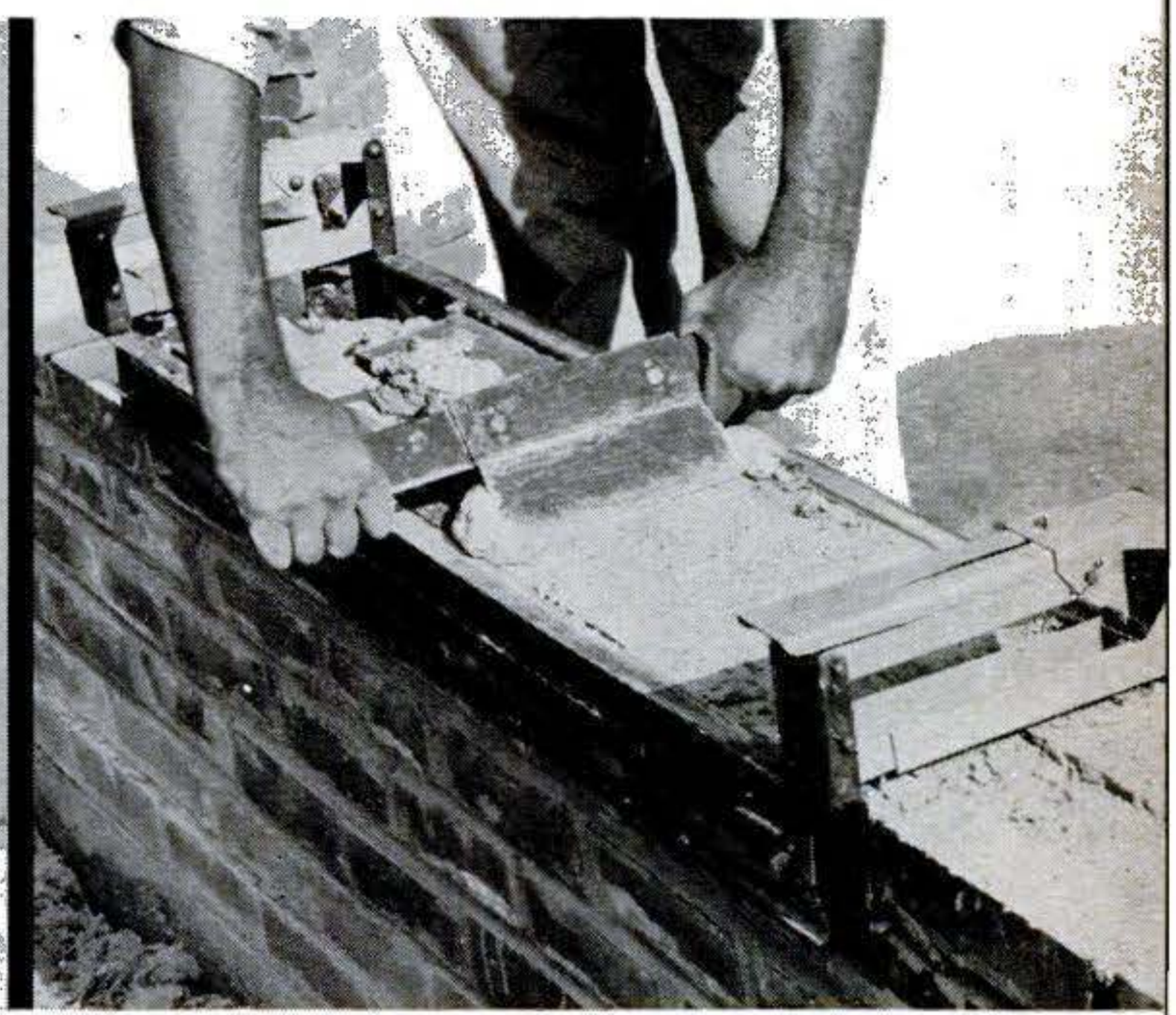
1 Worker clamps the frame on the top of a wall in first step of a new bricklaying method. Built-in levels in sides and ends of the device show him if wall is straight.



2 With this giant scoop a bricklayer can shovel up enough mortar in one big dip to cover the area inside the rigid frame where the bricks, eight at a time, will be bedded down.



3 Guided by vertical bars inside frame (plainly visible in photo No. 1), worker puts bricks in place. Laying bricks this way is said to be three times faster than conventional way.



4 Worker smooths mortar with "screed," filling in the cracks between the bricks. After this operation, the frame is shifted to the next wall section, and the procedure repeated.

Jig Speeds Bricklaying

ANYBODY can lay bricks—and fast—with the help of this new device. It is a frame that positions the bricks so that even an amateur can build a straight wall. The device, which clamps onto the top of a wall, has rigid sides and built-in spirit levels. This insures a true wall without the time-consuming process of checking with strings, plumb lines, and hand level.

To lay bricks with the frame, a big scoopful of mortar is first spread inside it. Then the bricklayer, guided by vertical bars on the inside walls of the device, sets eight bricks into the mortar. Another scoopful of mortar is smoothed over the bricks and forced into the spaces between them to form a strong, leakproof seal. The frame, which weighs only about 20 pounds, is then unclamped and shifted to the next wall section, and the process repeated.

Paul H. Sommers and John S. Hodgson, the fixture's inventors, report it enables bricks to be laid three times faster than by conventional methods and should greatly reduce the cost of brick construction. END

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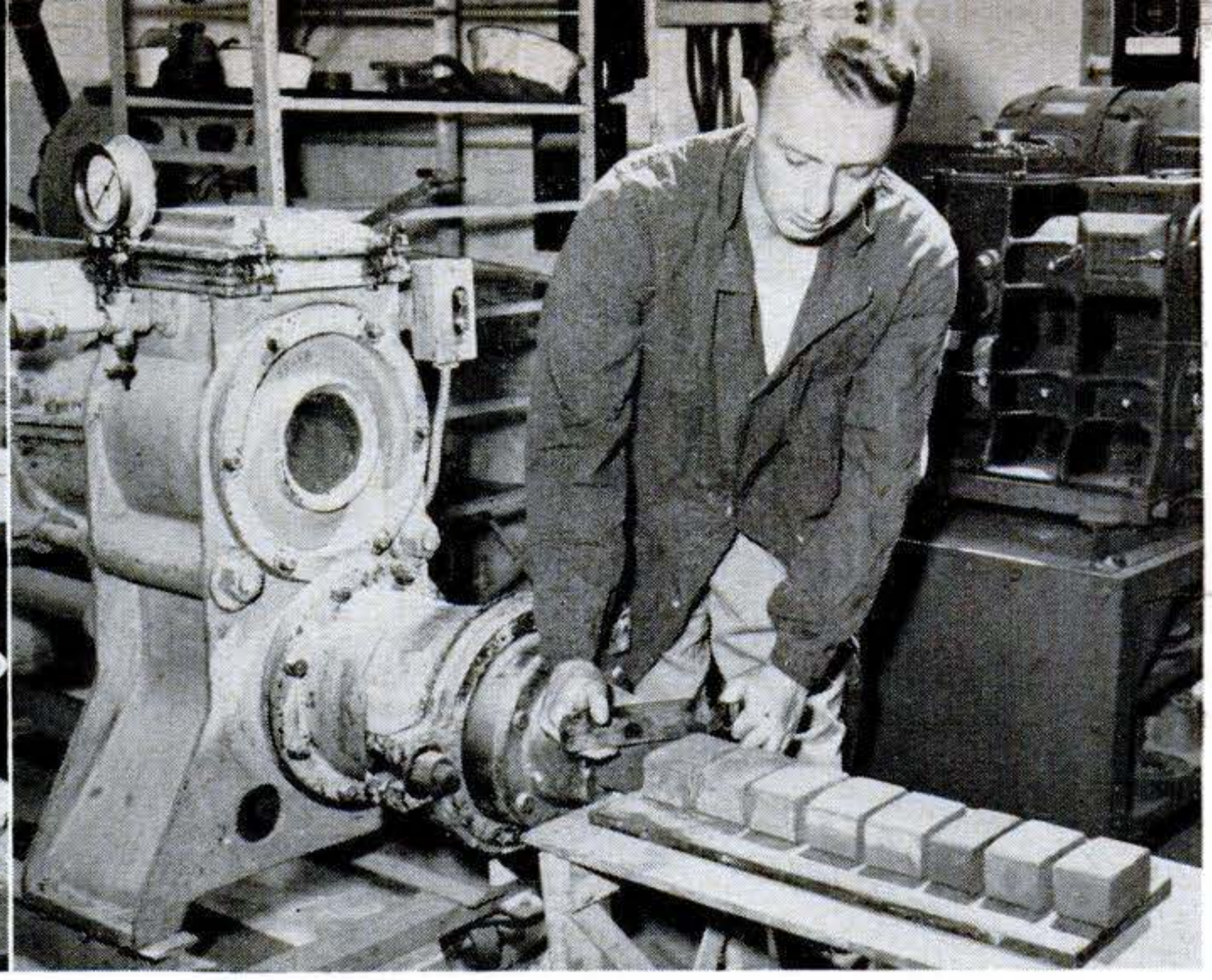

Waste Builds Better Bricks

Two hitherto worthless by-products of industry have been combined to make bricks that are both stronger and cheaper than ordinary clay bricks. At left above, William H. Bauer, the young Rutgers ceramist who developed the process, is shown in his laboratory measuring out fly ash, collected from soot traps in industrial smokestacks. In the pan to the left is slag, obtained from the bottom of furnaces burning powdered soft coal. These two ingredients are ground up, mixed together with a plasticizer and water, processed through a brick-making machine (shown at right above), and fired in a kiln. Now several companies are producing the new brick.

Hospital Bed for Home Use

ANY ordinary bed can be quickly converted into a hospital-type bed by placing this new Mengel Adjustabed® between mattress and springs. The upper plywood board is hinged in sections while the bottom board is flat. Adjusting the back rest by slipping a support into notches in the lower board permits seven reclining positions. Fitting the lower edge of the hinged leg sections into notches allows five leg positions.

Fountain Squirts Eyewash

As A worker bends over to take a "drink" from this fountain, he steps on a treadle and two jets squirt him squarely in both eyes. The streams are a neutralizing eyewash designed to prevent eye irritation from caustic soda used in grease making. Several trips a day to the fountain provide adequate protection. The fountain is in use at the grease plant at the Standard Oil of California refinery at Richmond, Calif.

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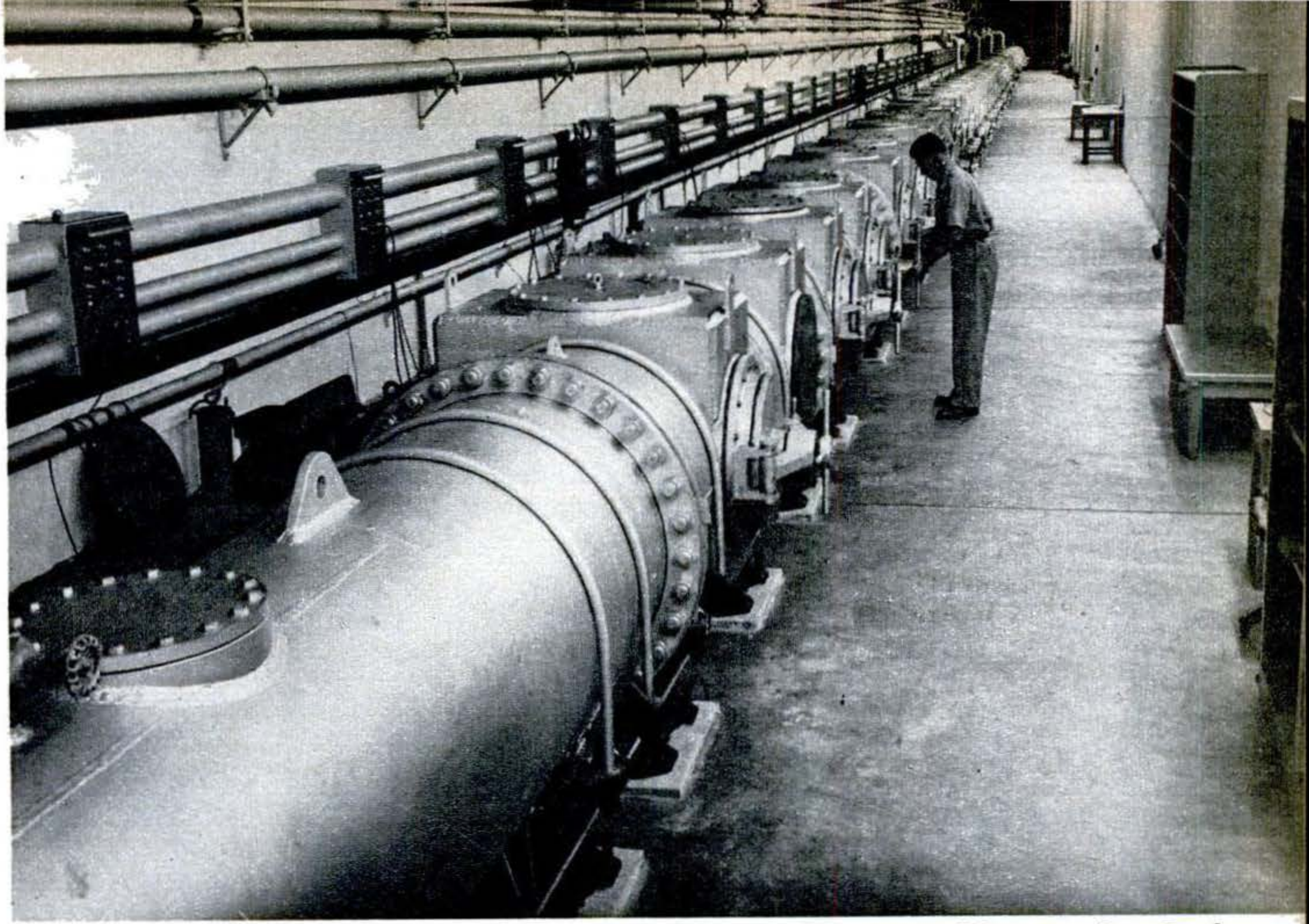

Pressurized spark range is a steel tube, 3 feet in diameter, 313 feet long. A 20-mm. gun at one end fires models into sand butt at other. Spark stations in between photograph the flight.

Model Missiles Shot Through Giant Tube

The Navy's pressurized spark range acts like wind tunnel in reverse; air stands still, models fly through it.

By John F. Loosbrock

A WIND tunnel that works backwards is showing Naval Ordnance researchers how missiles will behave in free flight. Called a pressurized spark range, it is located at the Naval Ordnance Laboratory, White Oak, Md. In a conventional tunnel, the model stands still while air flows around it. In the pressurized range, the model is fired from a gun down a steel tube. Twenty-five spark stations photograph its flight. The photos, both vertical and horizontal, give exact location and angle of missile at each station.

Pressures within the tube can be varied from as high as six atmospheres down to a virtual vacuum. This is what makes the range so valuable. In aerodynamics, increasing the pressure is the same as increasing the size of the missile. Thus, by firing a missile under a pressure of six atmospheres, Navy scientists can tell exactly how an identical model, six times larger, will behave at sea level. By changing pressures they can obtain invaluable information over a range of missile sizes from the tiny models used in wind tunnels up to the largest now on the drawing boards. The technique fills a long-empty gap between wind-tunnel tests and actual flights.

The range also allows study of models at speeds a wind tunnel can never hope to hit—the so-called "hypersonic" speeds. Tunnels, Navy scientists say, can be designed to simulate flight up to about 5,000 m.p.h. Above this speed air begins to liquefy, and the flow around a model is so rarefied that it's hard to photograph, even with Schlieren apparatus. In the pressurized range, no such limits are foreseen, and speeds well above 5,000 m.p.h. are expected.

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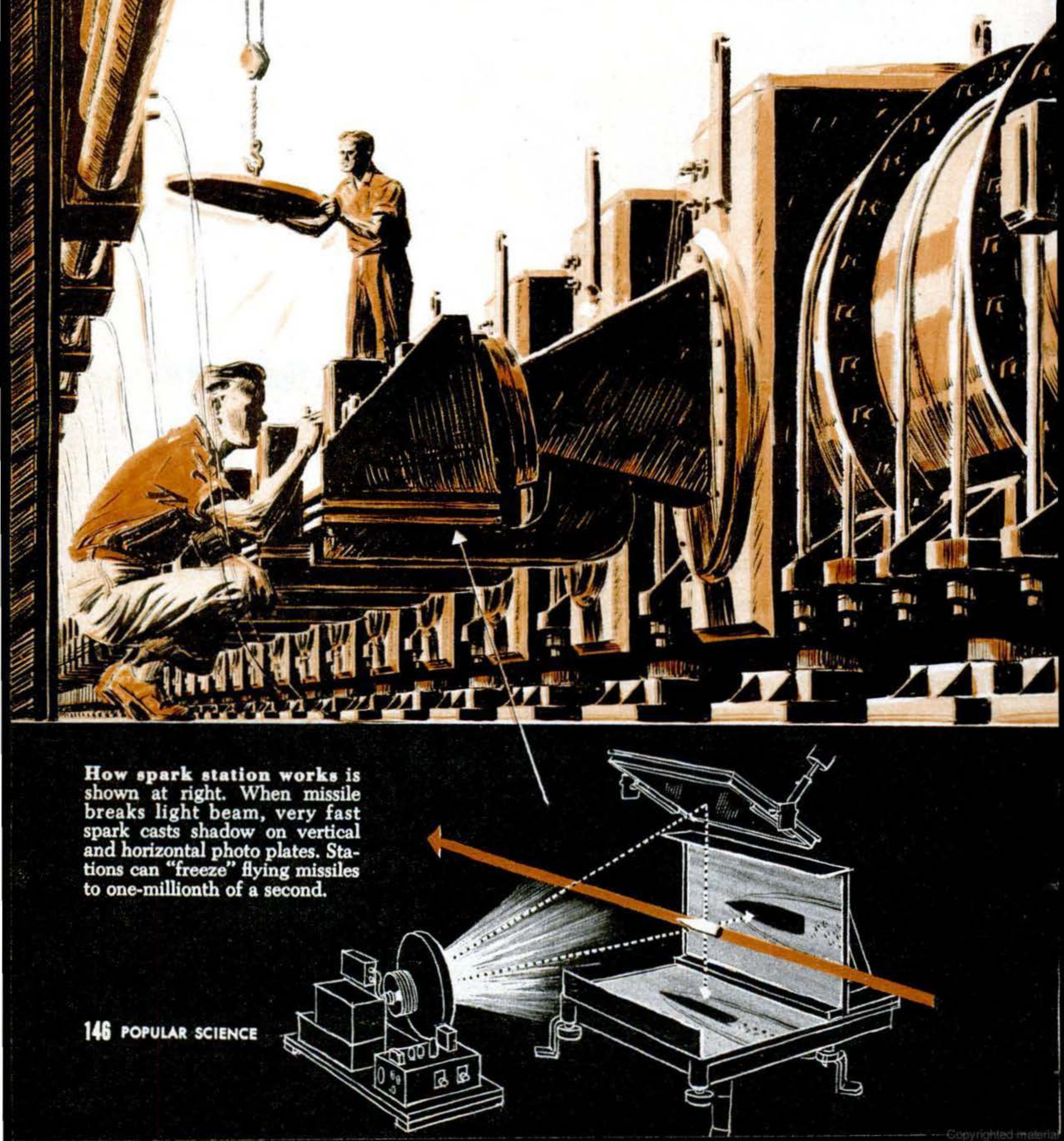
The tube is so precisely aligned that the only bend in its structure is that given it to suit the curvature of the earth, which makes it four-thousandths of an inch higher in the middle than at the ends. A 20-mm. gun serves as launcher for the miniature missiles. The propelling charge, specially measured for each model, is loaded into an ordinary shell case. The gun is then bore-sighted on a paper target mounted in front of the sand butt at the far end of the tube. (Sand is held in place by rubber diaphragms, which close after being punctured so the sand won't be scattered.) Then the gun is loaded, the tube closed, and the desired atmospheric conditions inside created with vacuum or pressure pumps, driers or humidifiers, and heaters or coolers. The gun is fired electrically, and spark photos are automatically taken as missile passes stations.



How spark station works is shown at right. When missile breaks light beam, very fast spark casts shadow on vertical and horizontal photo plates. Stations can "freeze" flying missiles to one-millionth of a second.

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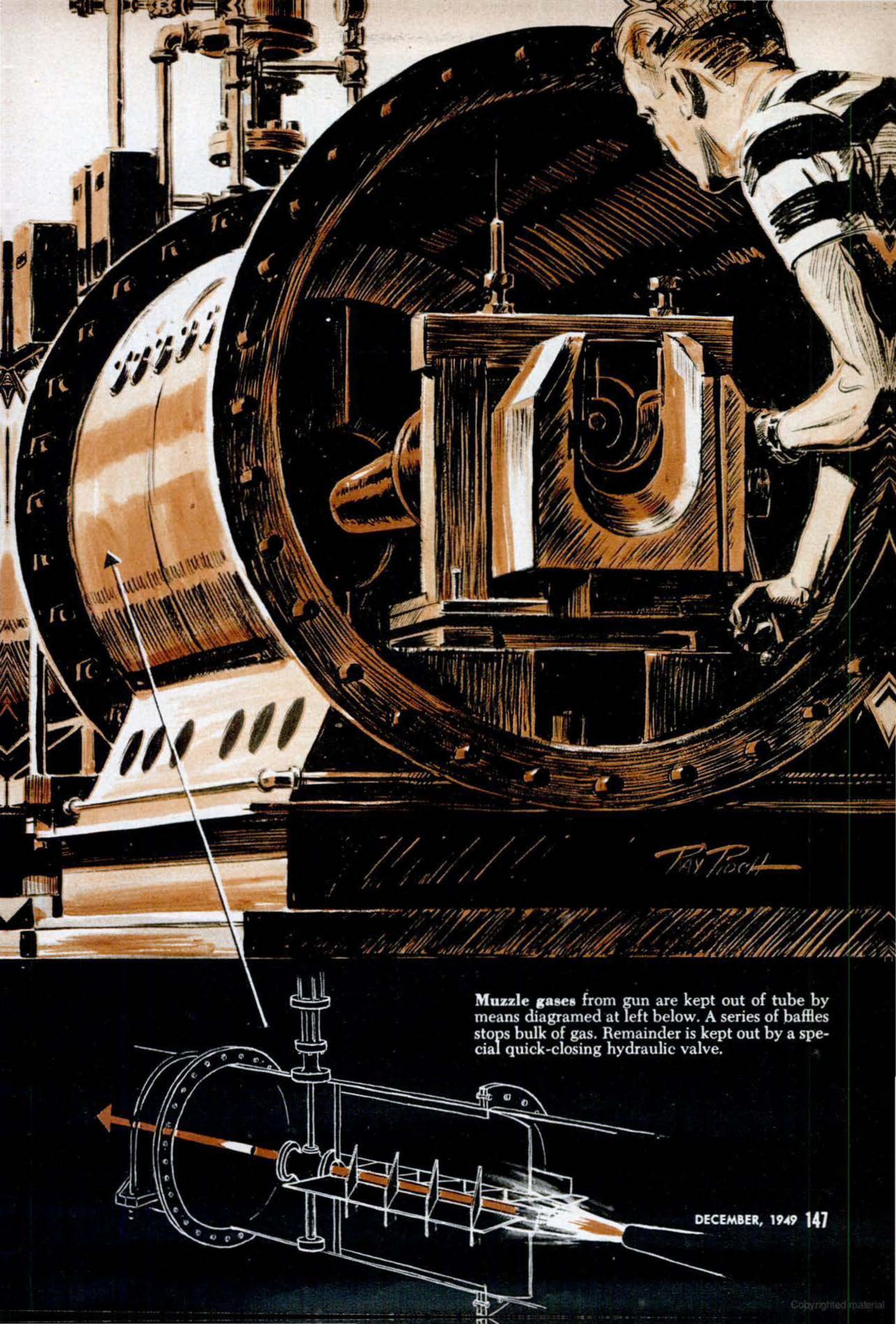

Muzzle gases from gun are kept out of tube by means diagramed at left below. A series of baffles stops bulk of gas. Remainder is kept out by a special quick-closing hydraulic valve.

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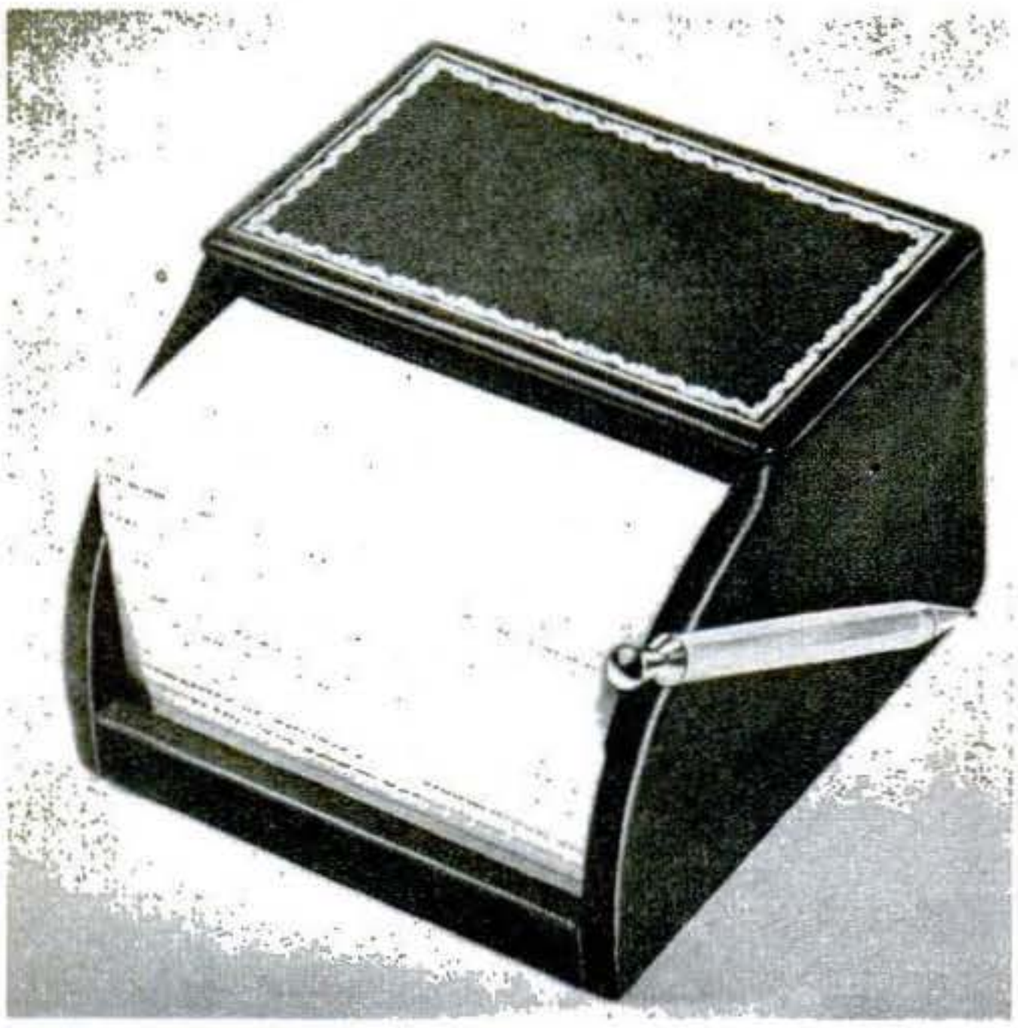
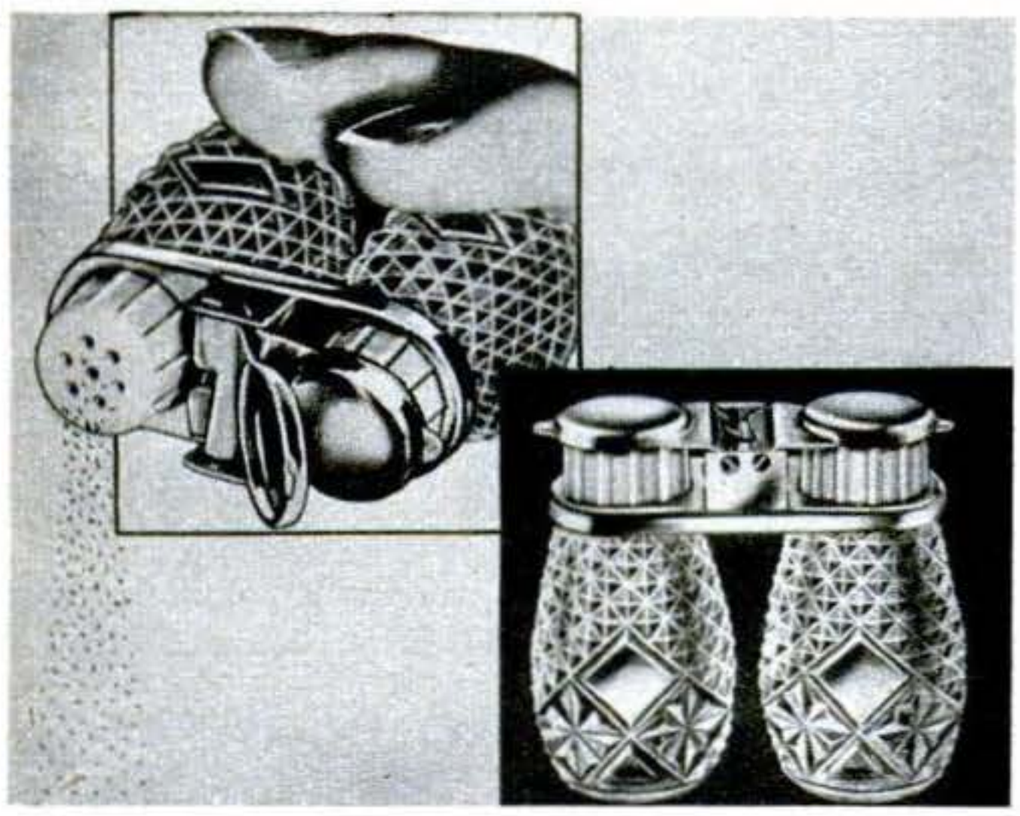
Aids to Modern Living

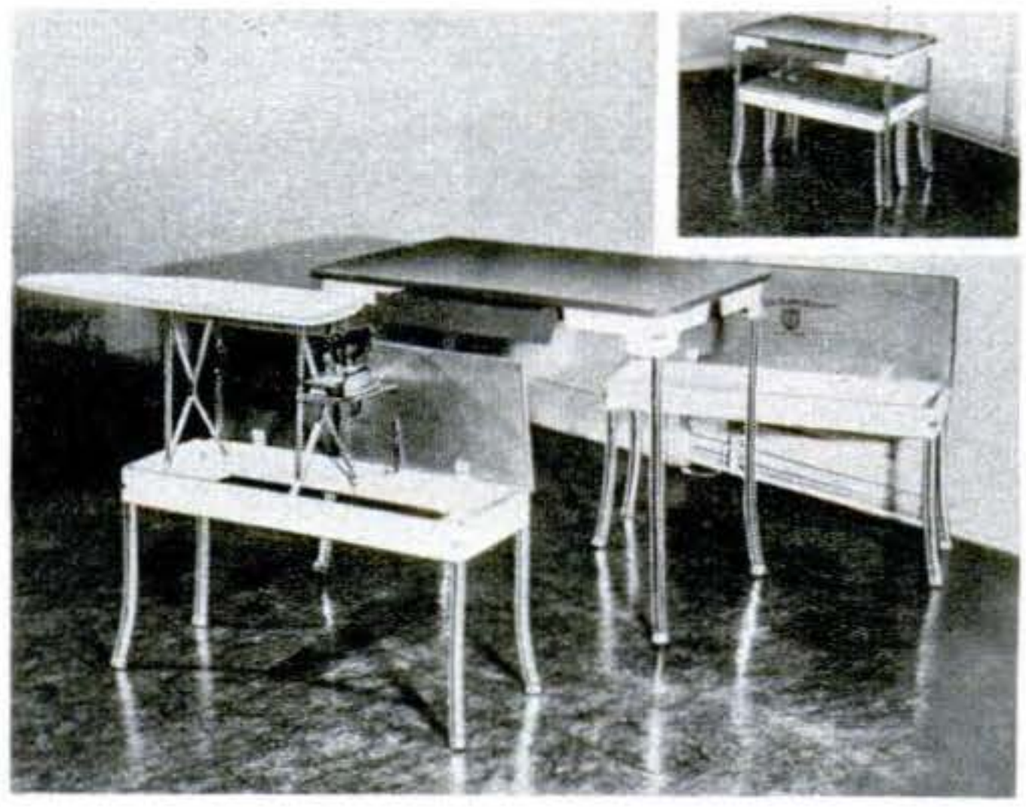


Magnetic Memo Box. The Side-Kick® memo box comes filled with about 900 4″ by 4″ sheets of paper and a gold-plated mechanical pencil. Magnetic attraction holds the pencil to either side of the leather-covered box. The American Binder Company, of New York City, makes the unit in 12 colors. The retail price is about $6.

Candlestick Adapter. Designed to take the wobble out of candles that don't fit their holders, this adapter has an expanding base to fit any candlestick. The candle is then inserted in the top. Ribs inside the top assure the candle a tight fit. F. H. Smith Manufacturing Co., Chicago, makes the adapters in aluminum and brass.



Shaker Has Spring Cover. Each unit of this salt-and-pepper shaker is fitted with a spring cover to keep out dirt and moisture. According to the maker, Central Equipment Co., of Chicago, the spring arrangement is built to stand up under long usage. The caps are available in red, blue, green, or yellow plastic. The price is 25 cents.



Triple-Duty Dinette Set. One bench conceals a built-in ironing board. The top of the other one covers a chest for linens or utensils. An all-steel table with a 25″ by 40″ top completes the set. The table top and seats come in four colors. The Doehler Metal Products Corp., New York City, prices the set at about $35.

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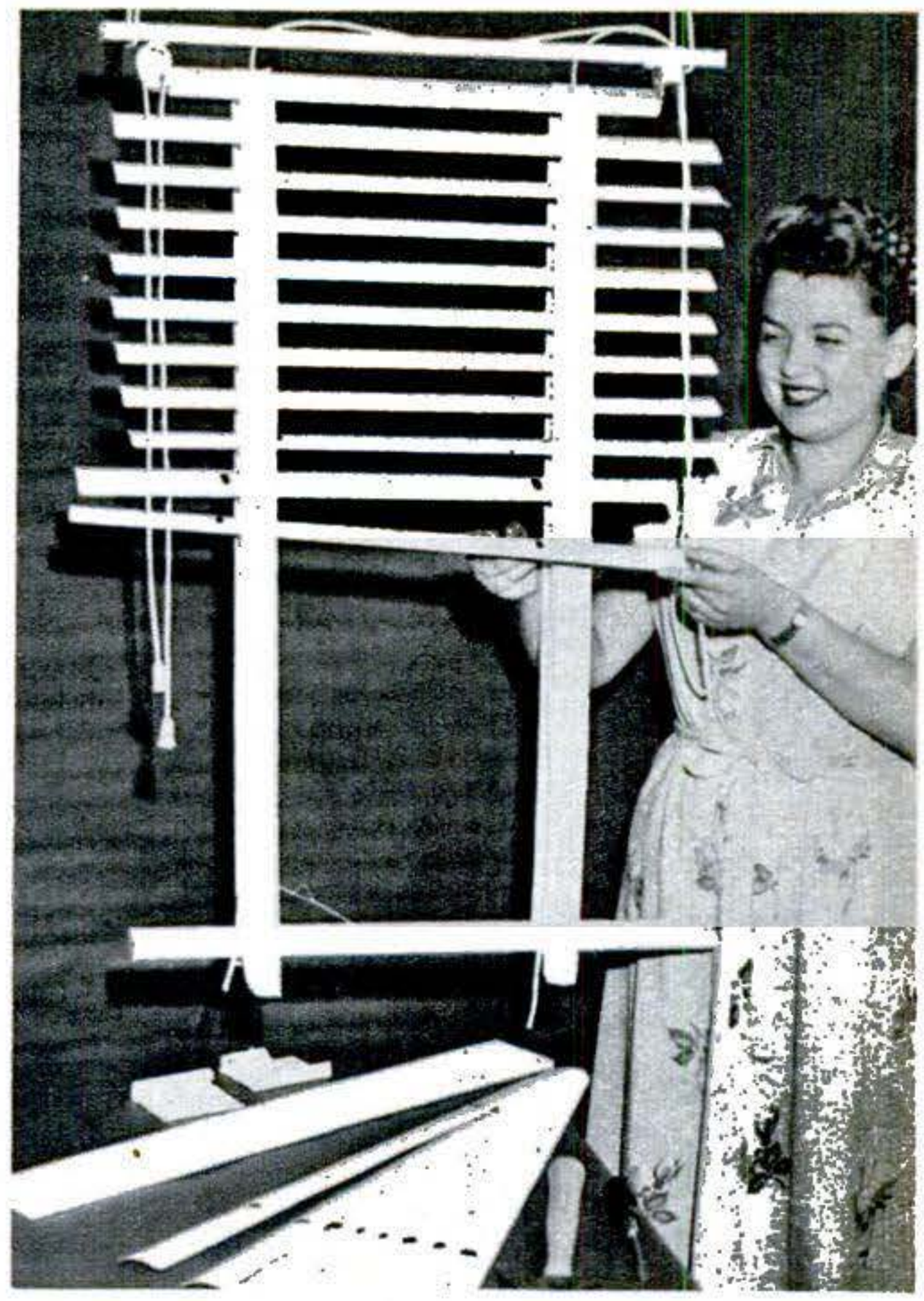
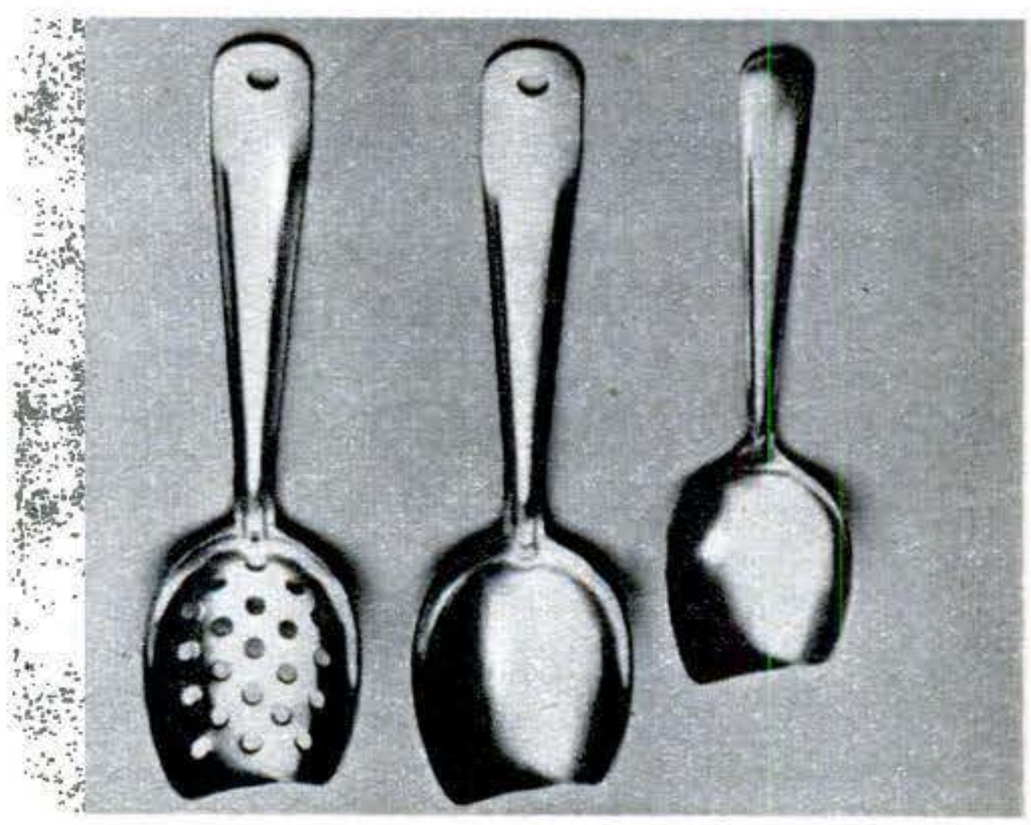
Bags Keep Food Fresh. Made of Polyethylene® plastic, these food bags are lightweight, tough, washable, odorless, and moisture-proof. They remain soft and pliable even at sub-zero temperatures. The W. A. Plummer Manufacturing Co., Los Angeles, offers the bags in several sizes ranging in price from 39 to 79 cents.



Assemble Your Own Blinds. Here's another way to beat high-living costs. The only tools you need to assemble the Venetian blinds made by the Flexolite Manufacturing & Supply Co., New York City, are a hammer and a screwdriver. The kit includes all parts, from aluminum slats to hardware, as well as step-by-step instructions.

Kit for Lamp Builders. Anyone can build a lamp with this kit. The Stand-A-Lamp® includes socket support, wiring, and base. The style is set by adding a shade and placing figurines or bric-a-brac on the base. Three sizes and shapes of base are available. The price is about $4. Shades are extra. The maker is the Royce Co., Inglewood, Calif.



Spoon Fits Pan Corners. Someone finally redesigned the business end of a spoon. These utensils, made by The Walter S. Medine Co., Hollywood, Calif., fit the bottom corners of pots and pans. They thus prevent lumping, sticking, and burning, says the manufacturer. Prices run from 50 cents to $1.50, depending on size and type.

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Junior-size shop equipment, this jigsaw, sander, and filing machine has a built-in motor. Its saw cuts to the center of a 16-inch circle. The toy has a sanding table, and uses ¼-inch machine files. It's made by National Scientific Products Co., Chicago, and costs $11.95.

New Toys For Children 2 to 92

PS photos by W. W. Morris

DAD and Grandad, Christmas-shopping for Junior, will find plenty of fun for themselves in this year's crop of new toys. Here's a preview of some that children from 2 to 92 will have a hard time keeping their hands off.

The main trends in '49-model playthings are greater variety, sturdier design. Lifelike items have been added to standard lines of trucks, construction machinery, and railroad rolling stock. Others offer increased realism for youngsters who want to make like grown-ups around the house. These range from a boy-size jigsaw of workshop quality to a doll that can talk whole sentences.

Manufacturers say increased supplies of wood, steel, and plastics have enabled them to improve quality without boosting prices. Sales for the year are expected to equal 1948's record of almost $500,000,000.

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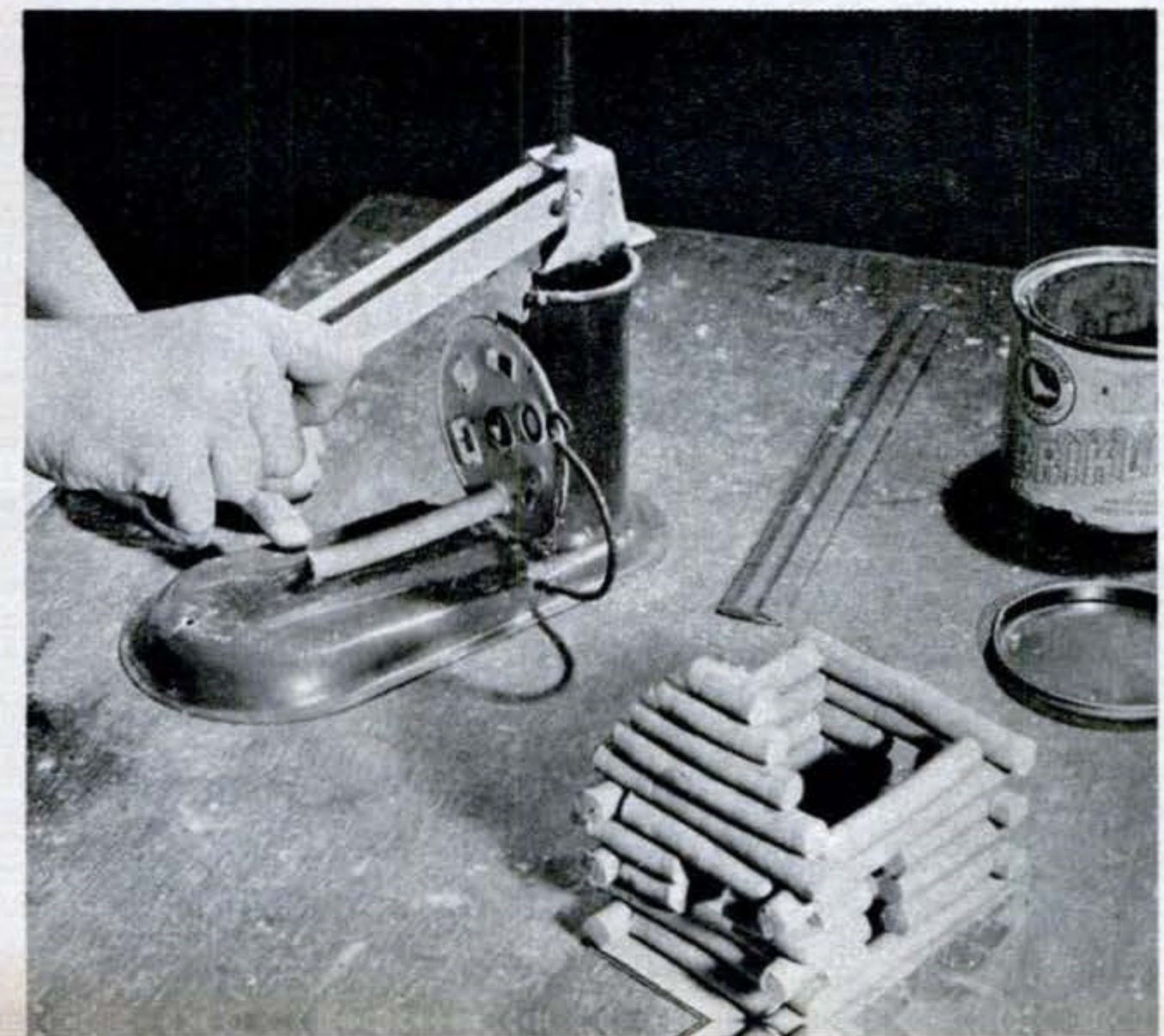
Remote-control dump truck in foreground runs forward, backs up, and turns under power and signals transmitted by flexible cable. Its chassis can be hitched to trailers in background. Smith-Miller, Inc., of Santa Monica, Calif., makes the models to sell for $8.95 to $14.95.

Brick Mill® below lets a child make his own bricks, logs, and other construction materials. Air-drying clay is forced down a cylinder by a hand lever and pushed out through dies that can be changed by turning dial. Tech-Art., Inc., of Milford, O., makes the set. Price: $2.98.

An introduction to bicycle riding is given by this toy that looks like a bicycle at one end but is balanced by a tripod at the other. For outdoors or indoors, Circle Cycle® won't bang up furniture. It is made by the Rufus B. Smith Co., of Cincinnati. The price is $9.95.



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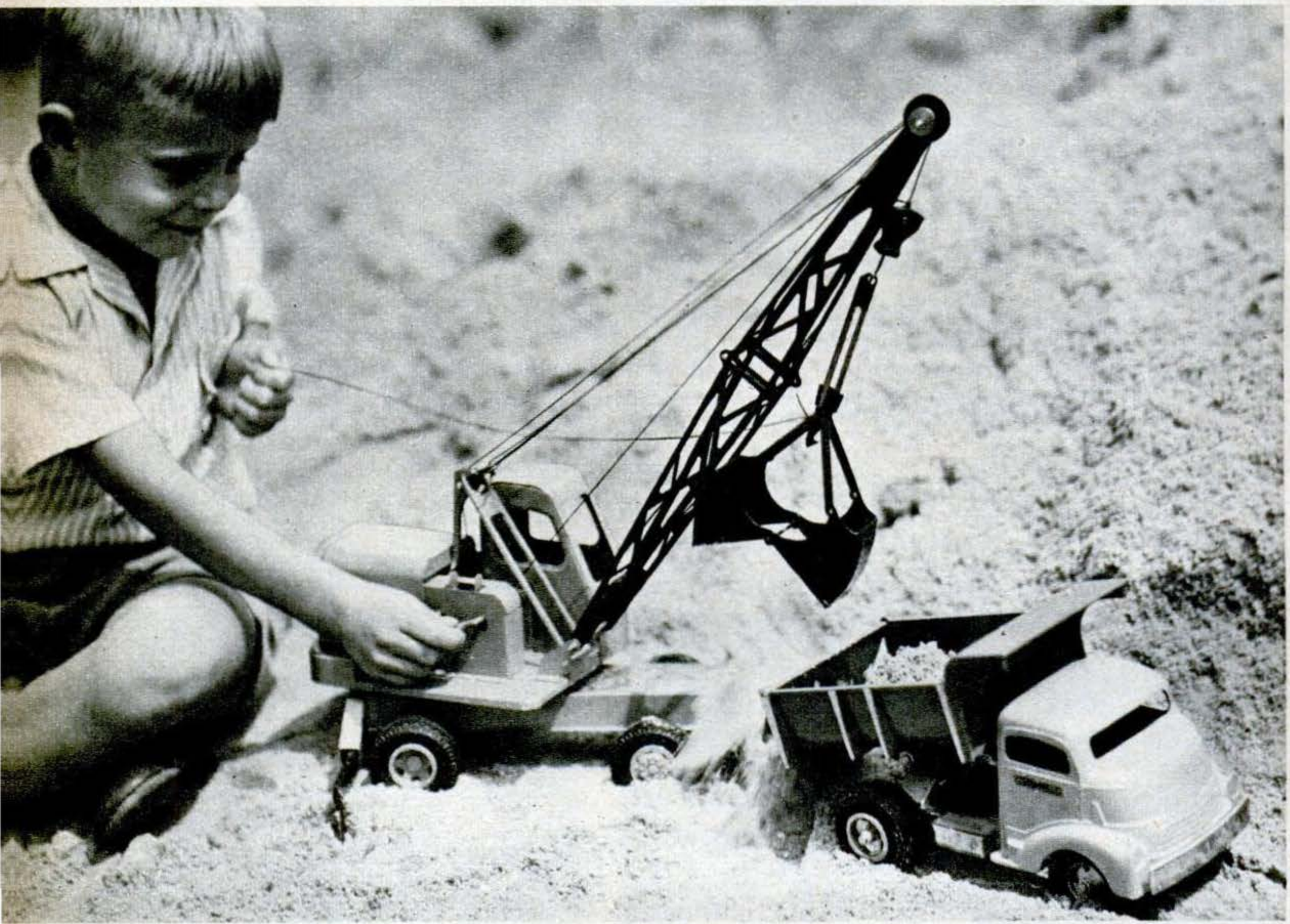
Here's a model utility truck. With automatic loader and covered body like a city trash truck, it's handy for dumping dirt at pint-sized excavations. After spilling dirt into a bucket at rear of truck, child turns a crank to raise the bucket to a hood that opens at the top of the body. When a release is pressed, truck body rises, dumping load out of the back. Made by Structo Manufacturing Co., of Freeport, Ill., the toy sells for approximately $5 retail.



A rugged addition to the Doepke line of scale models is the realistic Unit Mobile Crane® at left above. It has an 11½-inch body and a 19½-inch boom. The gear-operated cab swings in a full circle, and the front wheels are steerable. Outrigger bars with jacks can be pulled out to give the crane balance for lifting heavy loads. Cranks control the raising and lowering of the boom, and the handling and position of the clamshell bucket. The toy is priced at $13.95.

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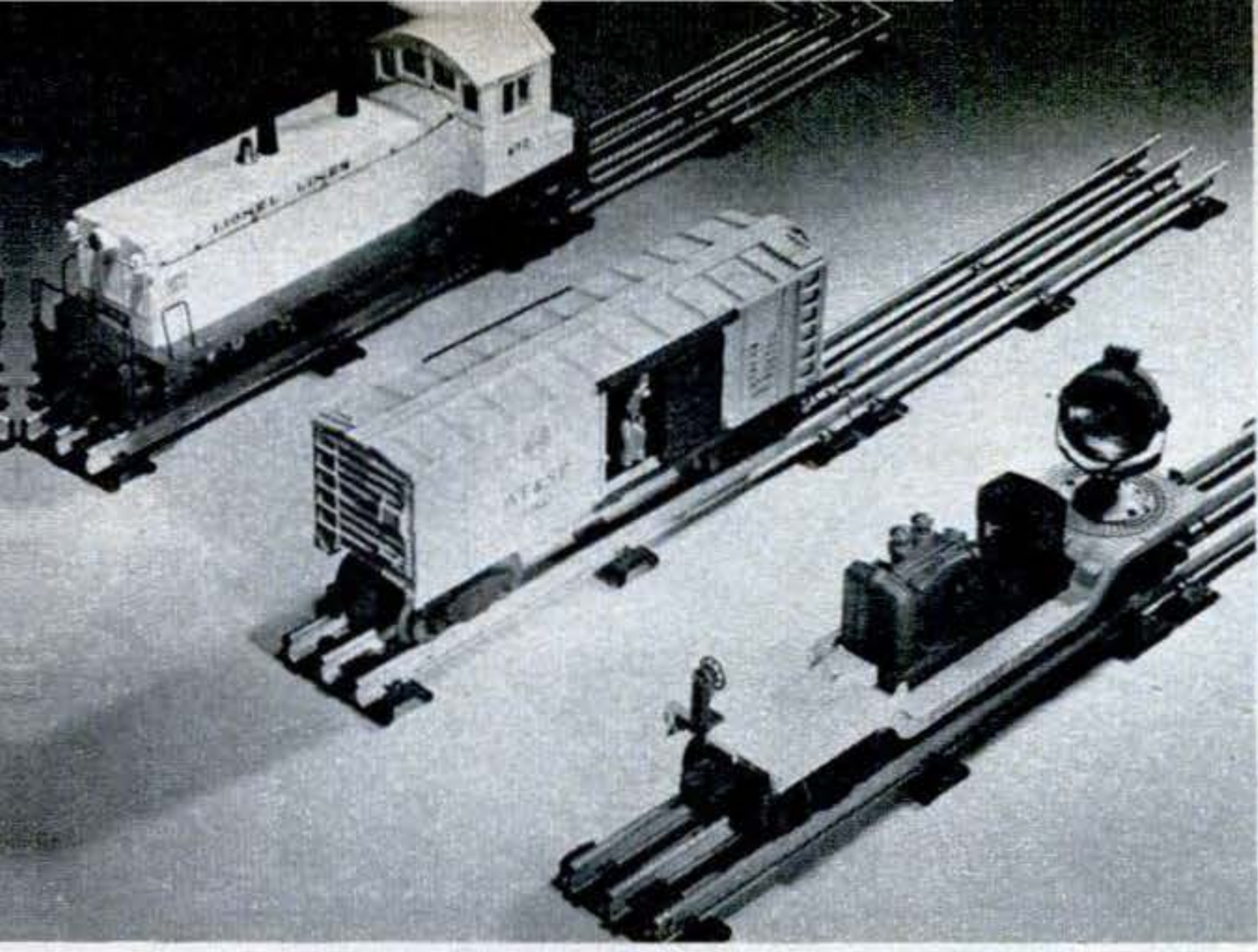
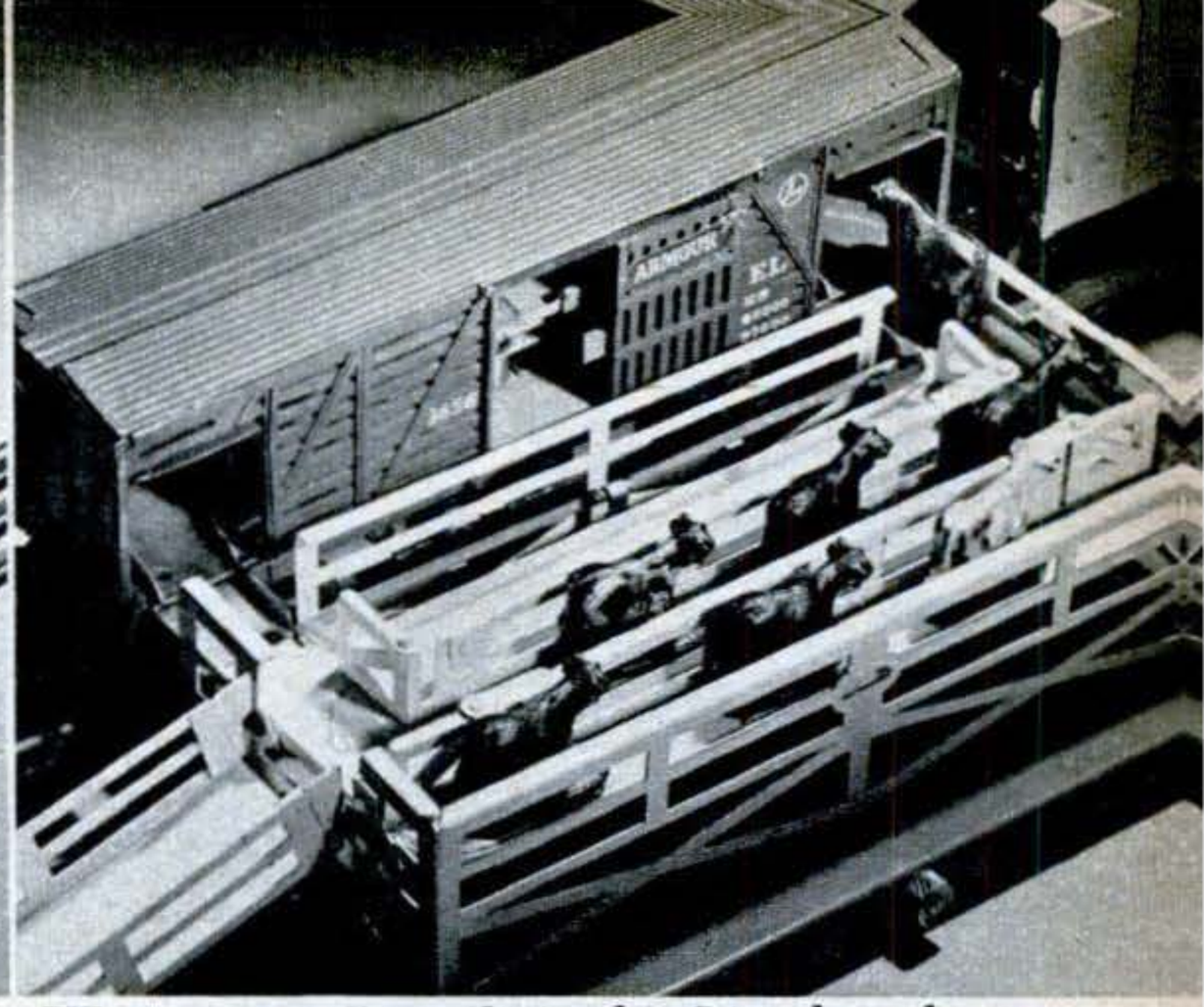
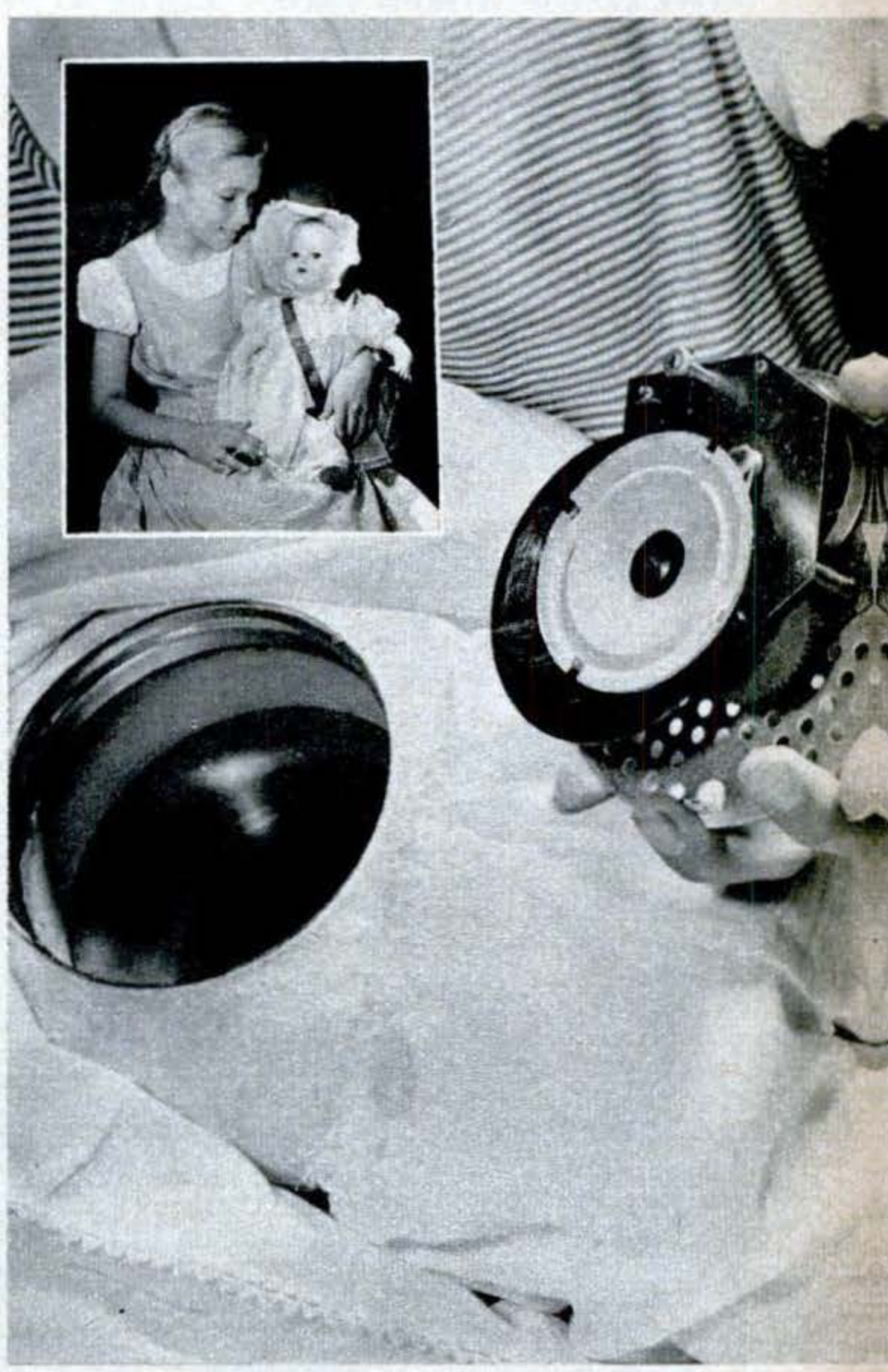


Three new Lionel '49 accessories are shown above. Left to right: scale model of General Motors Diesel switcher, $29.50; boxcar with a crewman to "push" open the door, $5.00; searchlight car with "Diesel generator," $6.50.



When magnetic coils in this Lionel cattle car and platform are energized, the accessory vibrates. This causes animals with "feelers" underneath to march from the corral into the car and out the other end. Price: $14.50.

Temporary outrigger wheels on the 20-inch Huffman bicycle above support a child until he is able to ride a two-wheeler. Raised off the ground, they still guard him if he falls sideways while learning. Bicycle costs $49.95.



The 22-inch doll in the inset above not only laughs and cries but talks whole sentences. A tiny wind-up phonograph, encased in her back, plays a three-inch record. Made by J. L. Schilling Co., of New York City, doll is $12.95.

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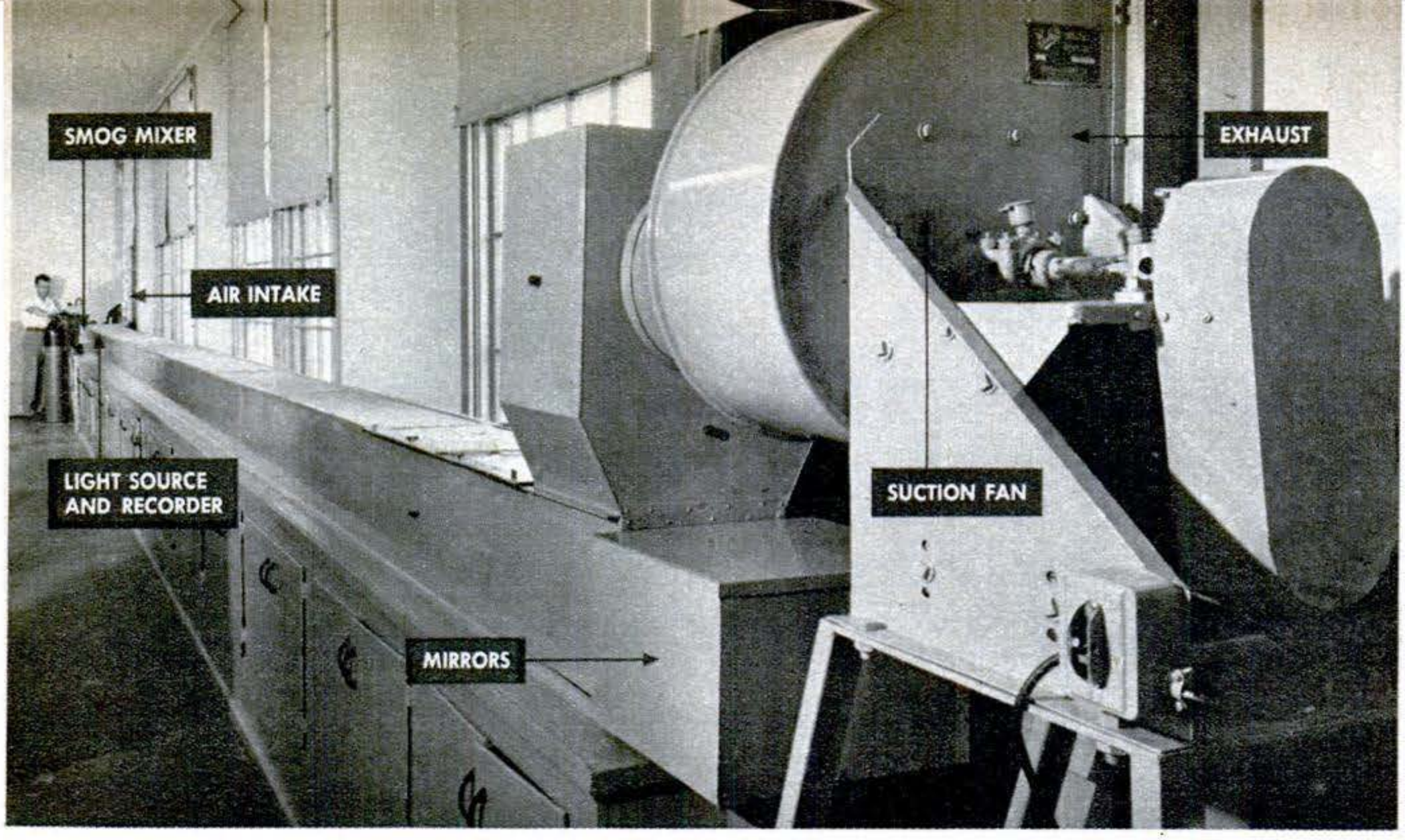


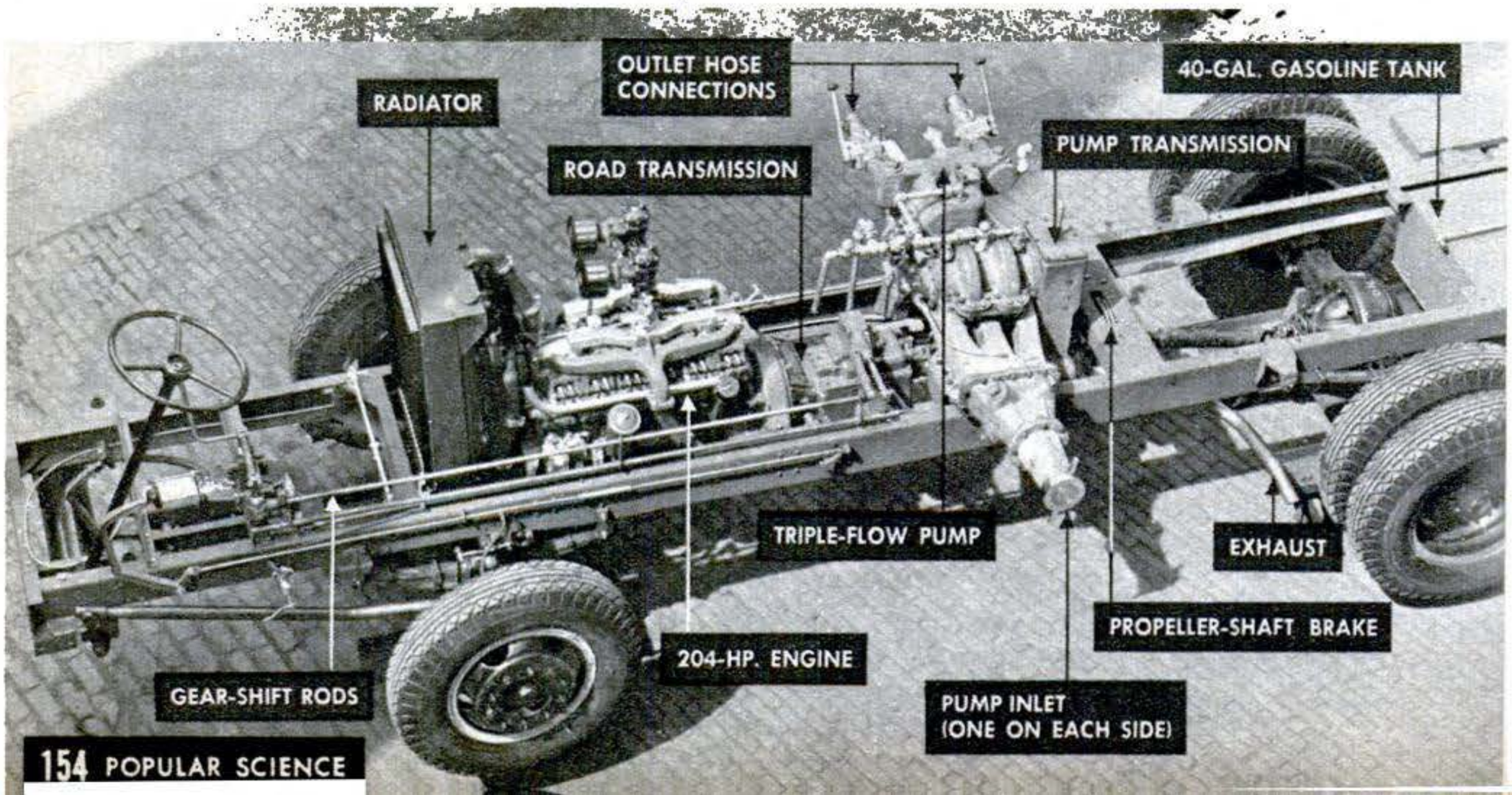
Machine Puts the "Evil Eye" on Smog

WHAT makes smog smog? Stanford University Institute is trying to find out with a room-long research device known as a transmissometer. Chemists create smog—fog plus contaminating agents—in the 40-foot-long chamber shown above and then measure visibility inside with great precision. The results help determine just what is in the combination of chemicals, dust, and moisture that turns noon to black midnight.

By adjusting mirrors inside the chamber, a beam of light is bounced back and forth through a measured quantity of a known smog mixture for a given distance. At the end of its journey, the beam strikes an analyzer that records how much it has been dimmed by the smog. The analyzer consists of a phototube that picks up the light, an amplifier, and a recording instrument that makes a permanent record of the light's intensity.

New Fire Truck Puts Driver Ahead of Engine

THIS odd-looking vehicle is the insides of a new fire truck designed to increase road visibility by moving the cab up front and the engine behind it. The manufacturer, the American-LaFrance-Foamite Corp., says the change gives the man at the wheel a better chance to spot that fire plug in an emergency. In addition, the truck has an unusually short wheelbase—only 12½ feet—compared to its over-all length of nearly 25 feet. This enables it to thread its way through narrow and congested streets and to turn in a radius of 25 feet. Putting the major chassis units between the axles is said to provide better weight distribution and good roadability on slippery pavements. The engine develops 204 hp.



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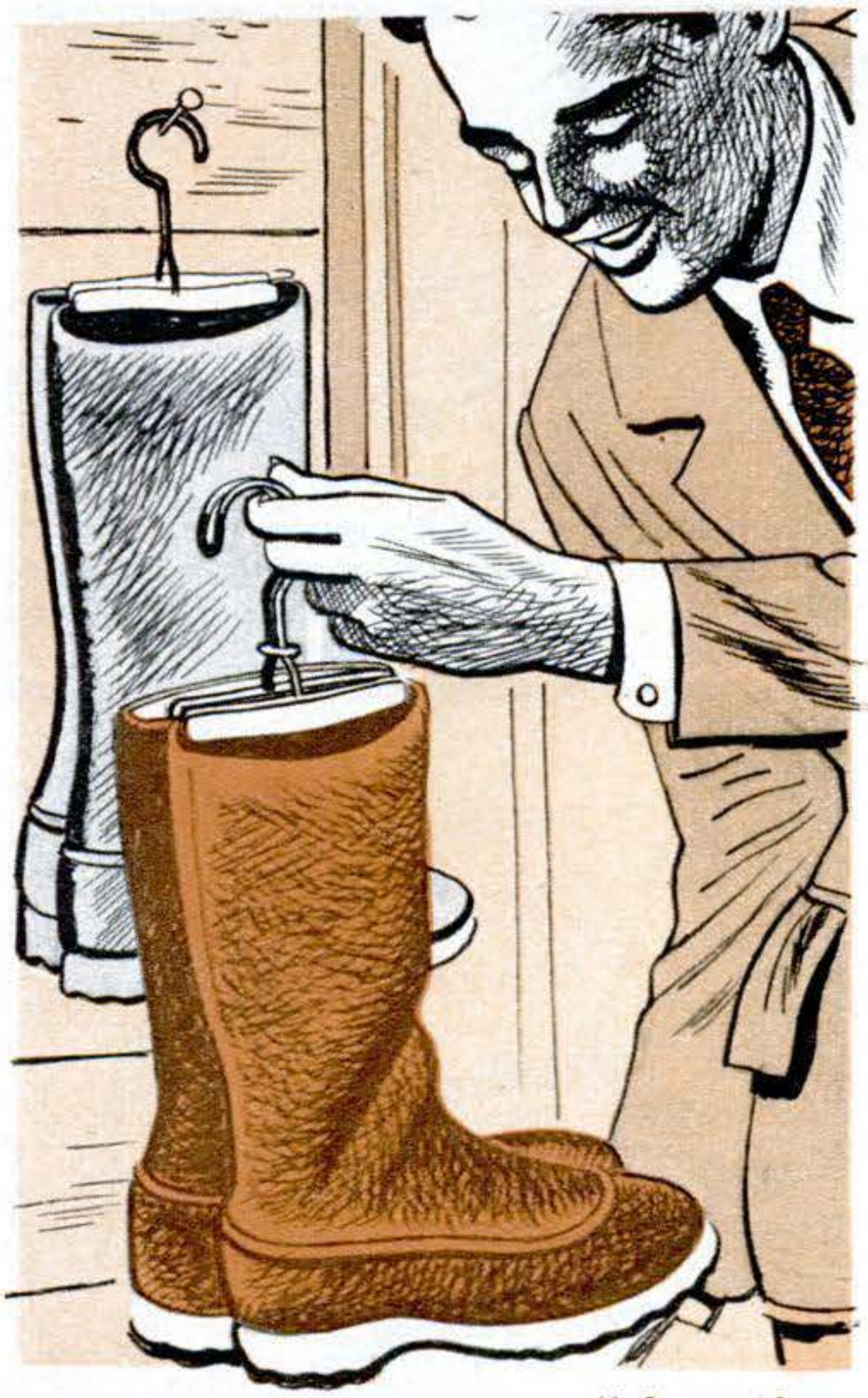
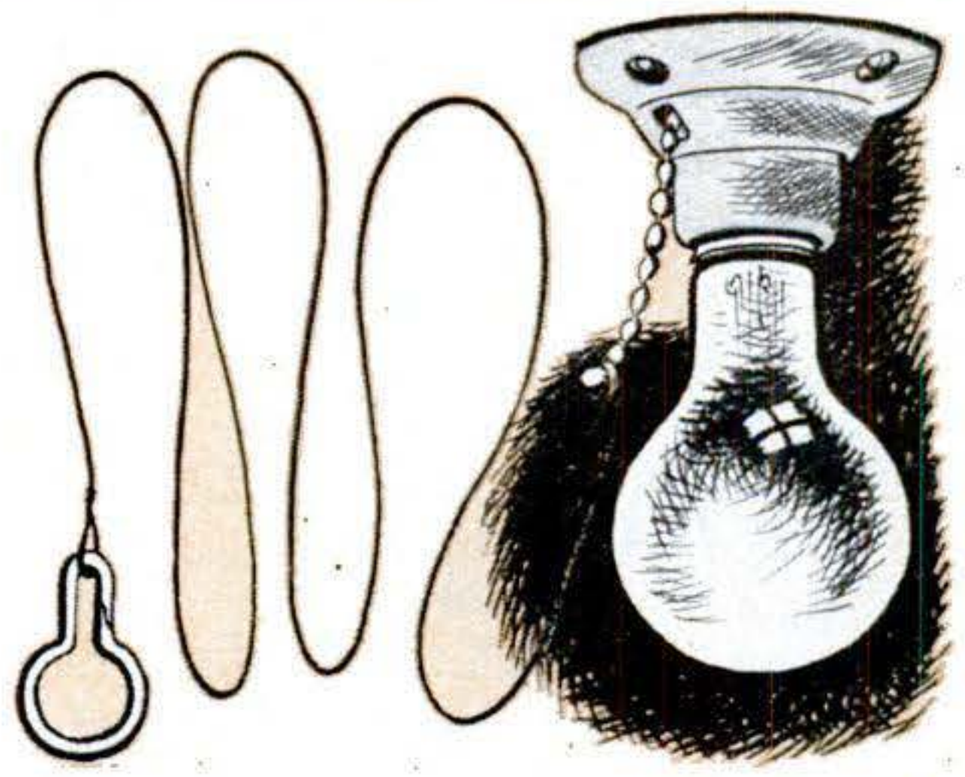
Keeping the Home Shipshape

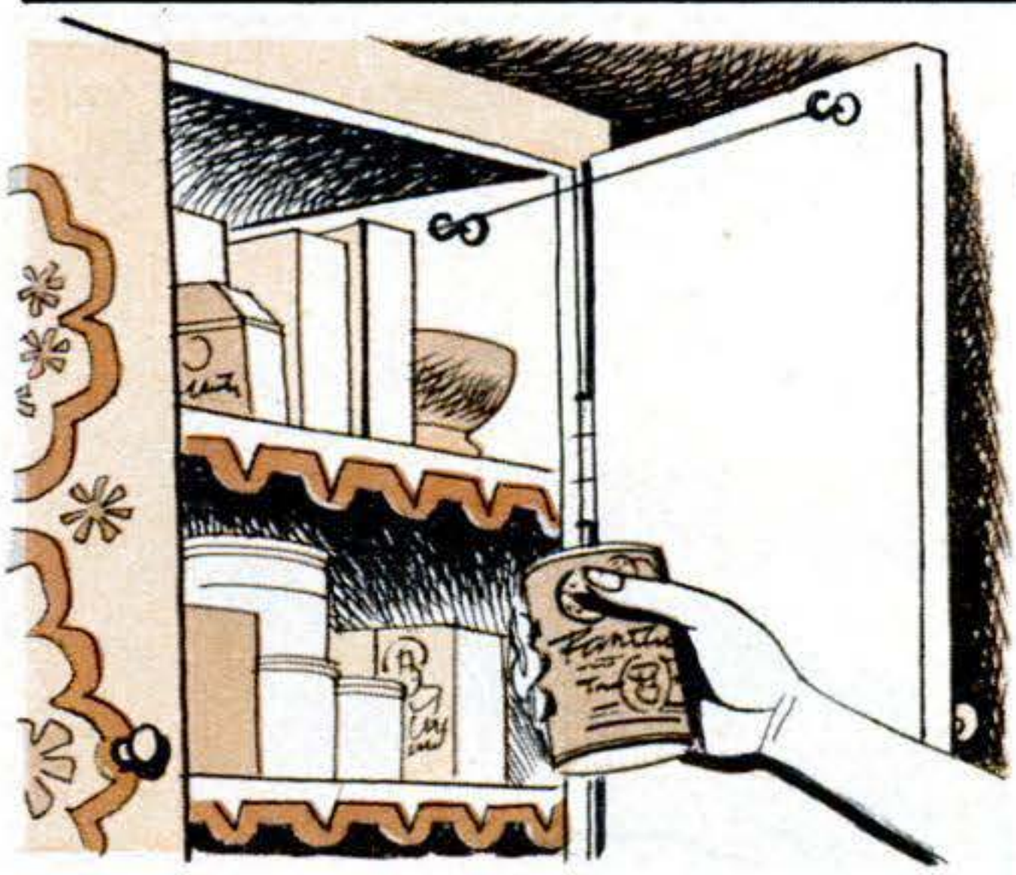


To keep boots in good shape, it's best to hang them up. Clip them in a trouser hanger as shown. It holds the boots straight and prevents them from wrinkling and cracking.

When touching up painted or varnished floors, you can protect the rug with a strip cut from an old plastic shower curtain. Fold the plastic around the edge of the rug.



An unbreakable lamp pull can be made with a wire banjo string and a shower-curtain ring. Tie the string to the chain and slip the ring through the loop in the other end.



Rubber bands will hold cabinet doors closed. Near the top of the cabinet, screw cup hooks to the inside of the door and cupboard wall and stretch a rubber band between them.

Besides spreading several layers of newspaper on the floor when painting chairs or tables, place a shallow jar lid under each leg. Then the painted legs won't stick to the paper.

Turn the page for 5 more suggestions

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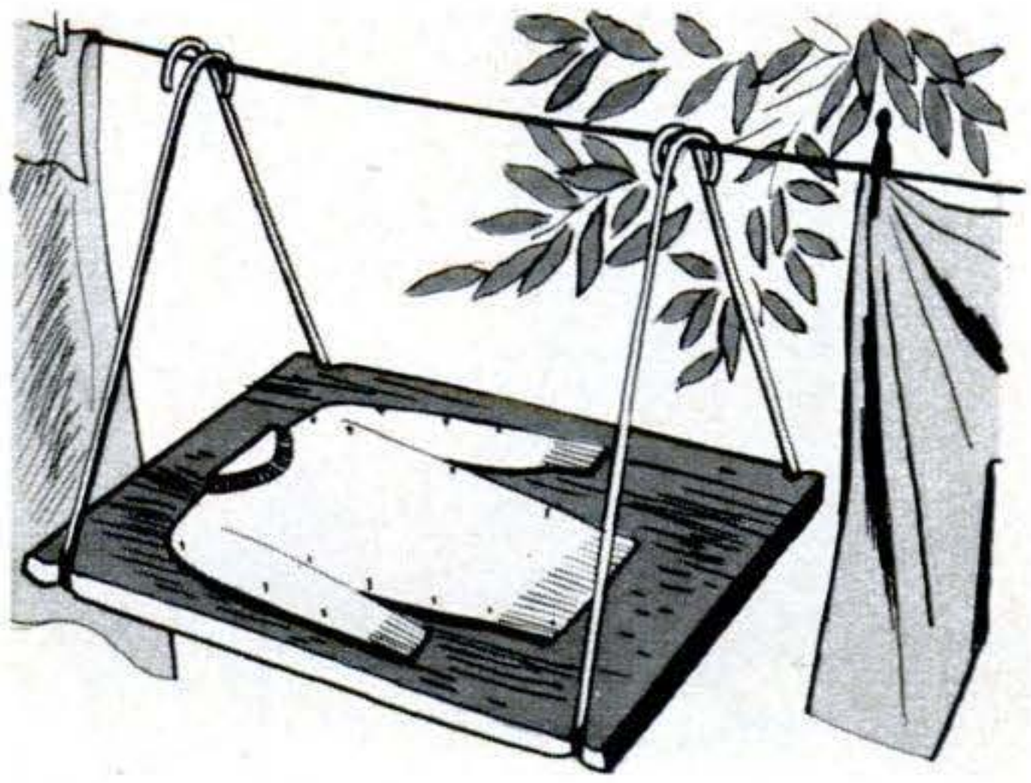
Keeping the Home Shipshape

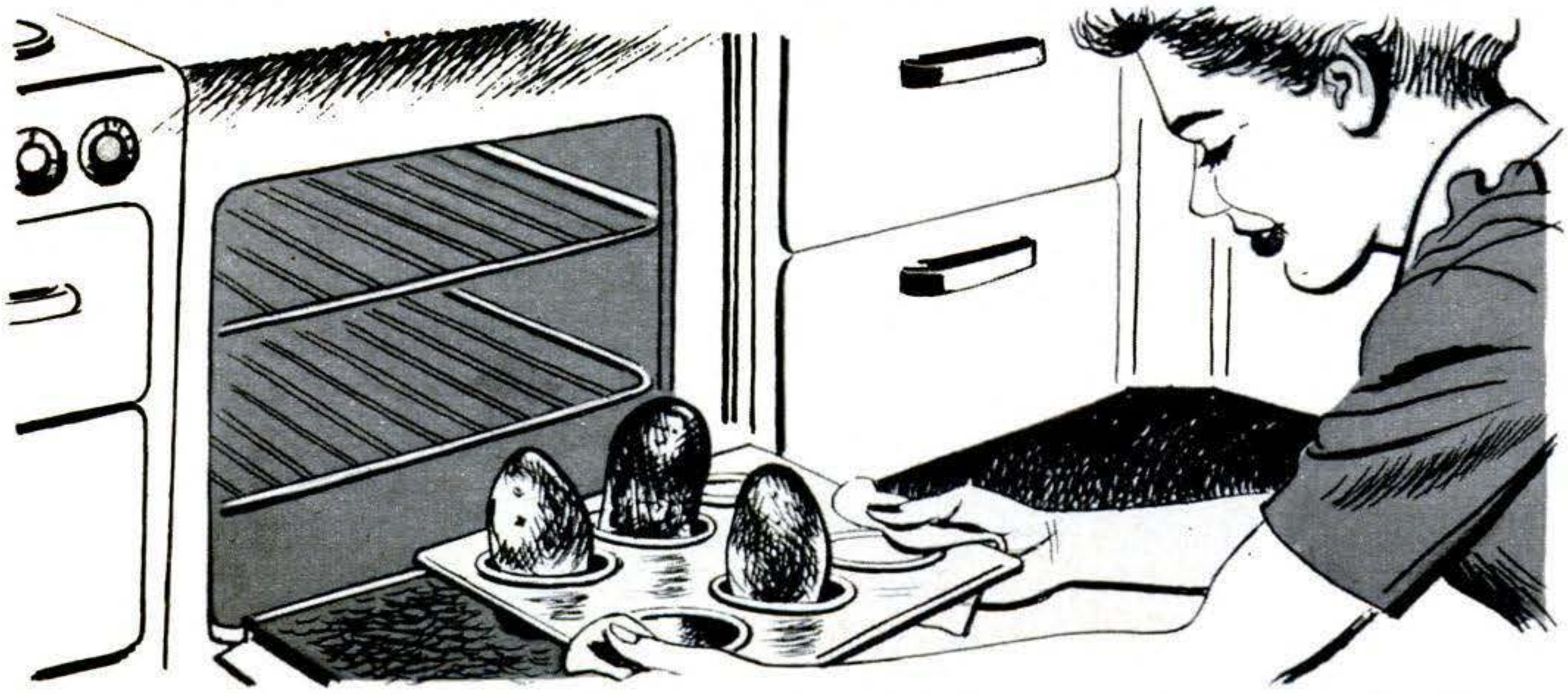
After laundering slip covers, let them get almost dry. Iron the pleated flounces and ease the slightly damp cover in place on the furniture. They'll dry smooth and wrinkle-free.

Colorful plastic clothespins have many kitchen uses. They'll hold up dripping jelly or cottage-cheese bags, act as curtain tiebacks, clip papers together, and hang up pot holders.

Stray drops of bleach that dribble down the bottle can ruin your clothes. Catch the drops by taping a strip of blotting paper or absorbent cloth around the neck of the bottle.



Make a sweater-drying rack of a piece of softwood plywood. Use the softwood because it's easier to shove thumbtacks into it. The hooks can be cut from wire coat hangers.



When you bake potatoes, use a muffin pan instead of an ordinary one. Sit a potato in each section. This keeps the potatoes from rolling about, and it's easier to remove them from the oven.

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Ornaments Can't Burn Tree

REFLECTED ultra-violet light makes these plastic Christmas-tree ornaments glow in four colors and eliminates the danger of fire. A lamp is placed at the base of the tree to shine on the ornaments. The manufacturer, Magic-Glow Corp., Chicago, also says that since the light is cool, it does not dry out the tree's needles like ordinary bulbs.

New 'Chute Cuts Shock, Sway

BY EXTENDING the skirt, or lower edge of the canopy, of its new nylon parachutes, the Navy reduces the shock felt by its airmen when they bail out at high speeds. The longer skirt lets the 'chute open more gradually and keeps it from swinging back and forth on the way down. The new 'chute has a diameter of 28 feet, four more than the standard type.

Jet Heat Cures Tobacco

AN ADAPTATION of the jet-aircraft principle enables Southern tobacco growers to cure their leaves with minimum fire hazard, less cost, and without fumes. House-heating oil and air under pressure are spark-ignited outside a curing barn and heat is fed to tobacco through tile ducts. The 90-lb. jet curer, below, is made by American Machine & Foundry, which says it will cut costs 30 percent.

Tractors to Reach New Stands

THANKS to tractors with huge rubber tires, Saskatchewan winter loggers can haul bigger loads further than ever—and open up new timber as much as 80 miles from the mill. Their big rear tires filled with water and anti-freeze to give traction weight, 240-hp. Diesel Euclids pull sled loads of 535 tons of logs 26 miles in 4 to 4½ hours. G. H. Godsall, Ltd., of Port Arthur, Ont., supplies the tractors.

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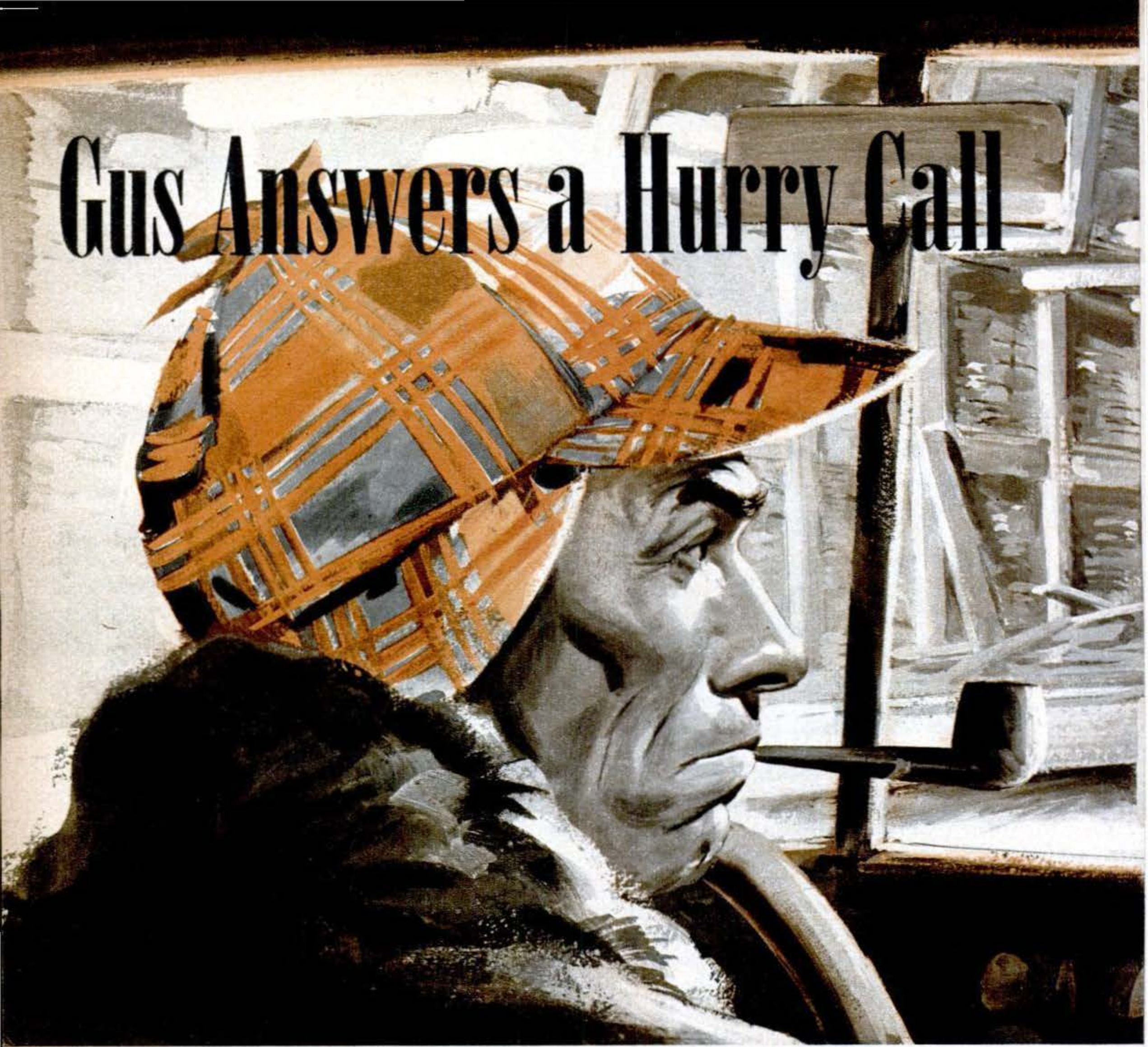
Gus Answers a Hurry Call



Warm engines usually run more smoothly than cold ones, but proving there can be an exception to the rule isn't too easy on a cold night.

By Martin Bunn

A BELL jangled. At first, it seemed miles away, and then much closer. Gus Wilson fumbled on his bedside table, found the telephone, and grunted "hello."

The voice sounded jittery and urgent. "Ed Blanding, Gus. Mr. Slemp's been hurt, and I'm in a jam—a bad one. Could you come out to the yard right away?"

Gus came wide awake. Griscom Slemp, elderly owner of a lumber yard at the edge of town, is an old friend. So is Ed Blanding, who's Gris Slemp's middle-aged bookkeeper.

"What are you doing there this time of night?" Gus demanded.

"I can't tell you anything more now. But for Pete's sake come on out."

Gus grunted an okay and the receiver clicked. Snapping on the light, he hurried into his clothes. The window thermometer read almost zero, and the clock showed midnight.

At Slemp's Lumber Yard, he found lights on and cars parked in the driveway. As Gus stopped, the blinding beam of a flashlight

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As Gus stopped, a flashlight was turned into his face. "Oh, it's you, Gus," said the voice of Trooper Corcoran.

was turned in his face. "Oh, it's you, Gus," said State Trooper Jerry Corcoran.

He led Gus into the office. Gris Slemp was tilted back in his swivel chair, white faced and looking sick. Ed Blanding was leaning against the wall, pale as his boss. Police Chief Joe Hurley was staring at the open safe. A young fellow whom Gus didn't know was mooching around the office—like a stage detective, Gus thought. A uniformed cop was at the door.

Slemp made a weak attempt at a grin as he addressed Gus. "Someone conked me with a sandbag. Got away with seven hundred out of the safe."

"Not a sandbag," the young stage detective corrected him officiously. "Crooks don't use sandbags any more."

The cops turned their eyes on the speaker, showing plainly he was no favorite. "You better look around outside," Chief Hurley said. "Maybe you can find some footprints under the snow."

Looking injured, the young man went out. The chief turned to Gus. "I ask for a plainclothes man and they give me this eager beaver, Swain. Just burnin' to be a *dee*tecative. And he's the mayor's nephew!"

"Ed phoned me—" Gus began.

"Yeah, I told him to," Hurley said. "Ed's sorta in a spot. Swain claims it was him who socked Slemp."

"Bunk!" Gus snorted. "Why, I've—"

"So have I," Hurley broke in. "But it looks like Swain's got somethin' on him."

The chief settled himself in a chair. "It's

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like this," he began. "For the last couple weeks Ed's been fussin' because his books don't balance. Been workin' almost every evenin' tryin' to find the mistake.

"Well, tonight, along about eight o'clock Gris Slemp's drivin' past the yard, sees the lights on, and comes in to give Ed a hand. They work until about half past nine. Then Ed says he's starved. Slemp tells him to go get a bite and come back."

Hurley consulted a notebook.

"Ed leaves here at 9:40. Slemp keeps on workin', opens the safe to get some papers—and leaves it open. After a while he looks at the clock. It's 10:15. Slemp thinks he hears a car outside about this time.

"Then somethin' knocks Gris cold. When he comes to, he crawls over to the phone and calls us."

Ed Gets Back Late

"That's at exactly 10:35. Swain and one of the boys get here at 10:41, along with Jerry, who got the radio flash."

"Ed still not here?" Gus asked.

"Just gettin' back," the chief answered. "Jerry and the others met him outside. He says he's been over to Mike's Lunch. They go into the office and Slemp tells them."

The chief paused and a look of annoyance clouded his face. "Now this here Swain gets a bright idea. He slips over to the lunch room and does some checkin'. Sure, Mike says, Mr. Blanding was here. He had a hamburger and coffee, and left a few minutes past ten."

Says Car Acted Up

"Swain comes back here and asks Ed how come it took him half an hour to drive back from the diner.

"Ed claims his motor kept buckin' and cuttin' out. Says it took him fifteen minutes or more to get up here from the railroad crossing.

"Swain claims Ed's lyin'—that he got back in time to slug Mr. Slemp, hide the money, and meet 'em out front."

Ed raised his head. "This is the worst thing ever happened to me," he quavered.

"Take it easy, Ed," Gus advised him. "We're all friends of yours. . . . About your car. Been having trouble with it?"

"Nothing special until tonight. Thought I was never going to get back here."

"Suppose we give it a test," Gus suggested. "You and Jerry come along, Chief."

Chief Hurley led Gus, Ed, and Jerry out to Ed's prewar sedan. Pulling out of the yard, Gus drove down the highway a quarter of a mile, made a U turn, and returned to the

Pump Motor Drives Scooter

THIS three-wheeled vehicle combines a surplus airplane wing tank, a 1½-hp. gasoline water-pump engine, scooter wheels, and an airplane stick for steering. Robert Ferreira built it as a high-school shop project in Danville, Calif. A chain drive from the engine to the single rear wheel propels the scooter at speeds up to 30 m.p.h. The steering stick turns the vehicle in the direction that it's leaned. Vertical is straight ahead.

Tire Shield Protects Mechanic

ADDING air to a big truck tire may seem perfectly safe, but accident records show otherwise. If lock rings are not properly set, the inrushing air may cause them to fly off with considerable force. Mechanics have suffered broken bones in this way. Some have been killed. For protection, Sgt. Isaac Guthrie, an Army motor mechanic, designed and built this shield. It's welded up from light angle steel, and can be slipped in place quickly.

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lumber yard. For a moment everyone remained silent. Then Ed Blanding spoke, a little uncertainly. "She runs fine now."

The Chief agreed. Gus looked thoughtful. "Maybe so—but I wouldn't want to say until I do a little trouble-shooting."

"Why not take the bus to your shop?" Hurley asked. "And take Ed with you—Swain will get him flustered again if he gets at him."

Ed Blanding drove. Gus wanted to make sure he didn't have some strange driving quirk. Again the car ran smoothly, until they were just about at the shop. Then it began to cough and buck.

Too Cold to Drive

"Been using the car much lately?" Gus asked as he raised the hood.

"Not much. Too cold the past week. Just back and forth between home and the plant—about half a mile each way."

"What happened tonight?"

"Well, I was in a hurry to get back, so I pushed up that steep hill below the crossing pretty hard. Just as I got to the crossing the lights flashed, and I ain't fool enough to try beating a train. There was another car, going the other way, that just did manage to stop in time."

"And your engine quit then?"

"Not right away. It ran ragged, stalled a couple of times, started again, stalled again. Time the freight was by, I thought she wouldn't get me to the plant, so I tried to flag down the car that had stopped the other side, but he was in such an all-fired hurry he near run me down."

Gus walked around and peered at the instrument panel. The ammeter registered charge and the heat indicator showed the engine was at operating temperature.

"Takes the engine quite a while to warm up in this weather," Gus observed. "It didn't really until just before we got here."

What Might Be Wrong?

What *could* cause a cold engine to run perfectly—and cut up when hot? Gus scratched his ear the way he always does when he's thinking. Vapor lock? Not likely. An obstruction in the fuel tank? That would cause trouble at *any* engine temperature. The automatic choke? That *would* bear checking. The air cleaner?

"Washed the air cleaner lately?" Gus asked.

"Yep. Couldn't be anything wrong there. Had it off only ten days ago, washed out the element and re-oiled it—just like the book says."

"Put back the cleaner good and tight?"

"You bet!" Ed stated emphatically.

Gus looked at Ed. "I guess you did," he said, picking up a screwdriver. "Keep the engine going—and listen."

He put the screwdriver on the clamp holding the air-cleaner body to the carburetor air horn. Slowly, he backed off the screw a little.

The engine, sputtering only a moment before, now settled down and never missed a lick. Gus straightened up. "That's it," he said, grinning.

Ed started to speak. "But what—"

"You turned that screw so hard you warped the carburetor air horn enough to bind the automatic choke." Gus put a match to his pipe. "That's something else in the instruction books. Don't put on the air-cleaner clamp too tight."

Needed: Proof

"The engine was cold and the choke valve closed when you did your cleaning job. After you started the engine, the valve tried to open, did part way, but couldn't open all the way—as it should when the engine's warm.

"Because it's been such cold weather the past week, the engine never had a chance to warm up and you got by without trouble. But coming up that steep hill from the diner tonight and waiting for the freight, the engine finally got warmed up. With the valve stuck, the engine was over-choked. Get it?"

"Guess so," Ed said. The shop door blew open, admitting Chief Hurley in a cloud of snow.

Gus told him what he'd discovered.

"Fine job, Gus. But it won't clear Ed with Swain. He'll want proof."

The shop phone rang imperatively.

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"Probably for me," Hurley said. "Told the boys I was coming here." He listened for a moment and hung up.

"State trooper six miles out collared a reckless driver, but that's no help to you, Ed. Can't you *prove* you stopped for that freight?"

"How can I? The trainmen couldn't tell one car from another in that snow. Only guy who got near enough to see me almost killed me getting away." Ed explained again about the car he'd tried to flag.

"Meet any other car?" Gus asked.

"Not a one."

"Notice anything about that car?"

"Too dark," Ed said despairingly. "Just a sedan in a blur of snow. Went off so fast he almost skidded into the ditch. Hey, wait—it seems to me his taillights were flickering."

Hurley stood up. "Say, it might be the guy the trooper just picked up. The trooper noticed his taillights flicker and took after to tell him they'd have to be checked. Instead of stopping for the siren, this bird gave him a race. So now he's booked for speeding and reckless driving."

Gus pulled on his pipe. "I'd check that car thoroughly, Chief. Remember the time. Ed left the lunch room about 10:10, got to the crossing at 10:25, just about the time whoever hit Slemp would reach the railroad from the other side. Add it up."

Hurley dashed for the phone, and gave some crisp orders. They all jumped as the phone shrilled ten minutes later.

"Yeah?" said Hurley. "Oh, just a hunch . . . Good."

He hung up, beaming. "Ed, you're clear. Gus, you're a whiz. Do you want a job on the force?"

"All I want," Gus said, "is sleep."

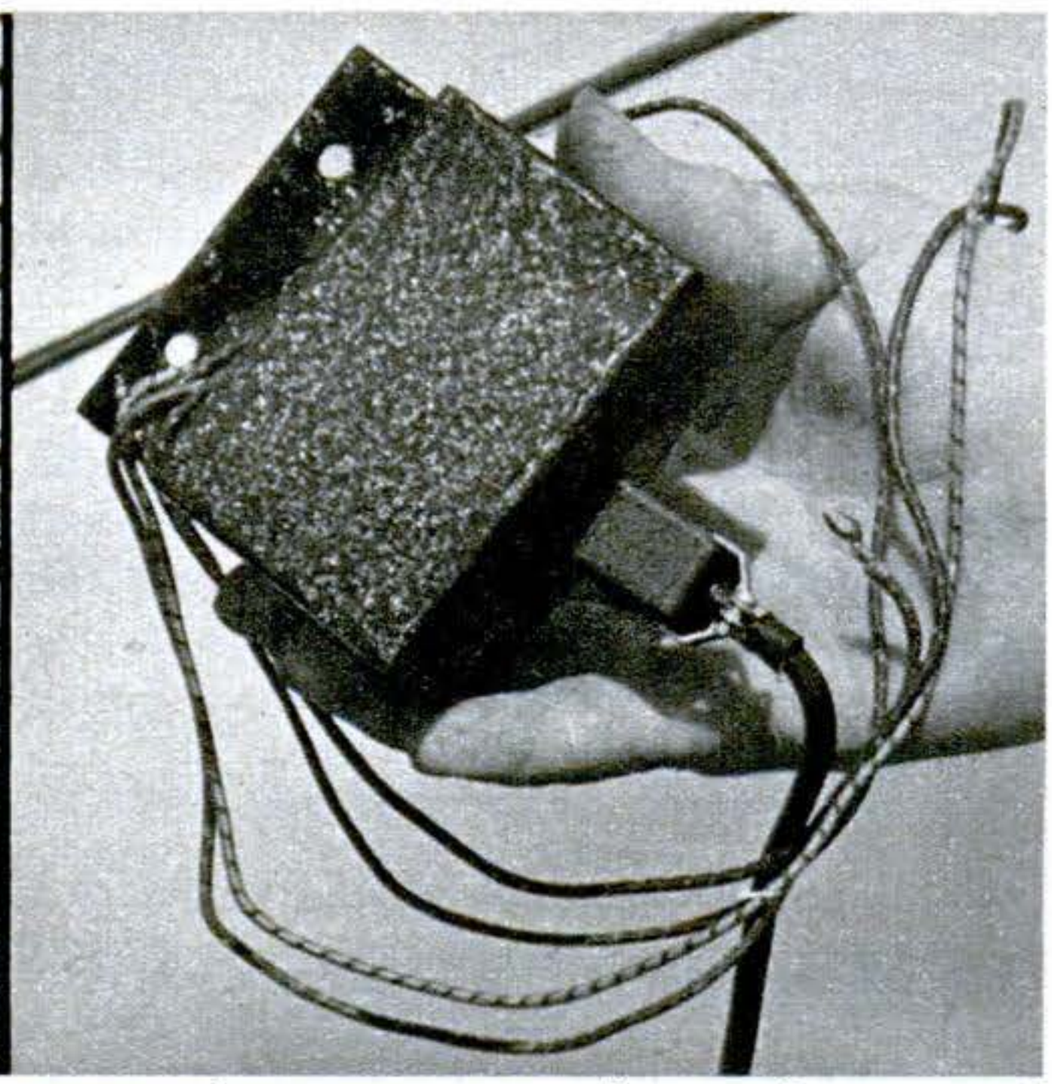
"They searched him and found nothing on him, so they took the car apart. The dough was stashed back of the lining in the trunk compartment. After that he confessed. How come you saw it, Gus?"

Gus pulled something from his pocket and held it up.

"Study does it," he said.

In his hand the others could see a book—a paperbound whodunit. END

Remote Switch Starts and Warms Up Car Engine



UNLESS you warm up your car engine to operating temperature before pulling out of the garage, water and gasoline will condense in the oil system. Sludge will form and lubrication will be impaired. Warm-up is especially important in winter.

A remote-control device developed by J. W. Schaeffer, Youngstown, O., enables you to start the engine without leaving the house. The unit is installed under the dash or in some other convenient place and connected to the starter and ignition. On leaving the car at night, you plug in a 115-volt line that runs to the house. In the morning, you throw a switch and the car starts.

Called Re-Moto-Start®, the unit will sell for about $15. It can be used only with cars having starter solenoids. The inventor recommends that you provide a means of ventilating the garage to remove exhaust gases.

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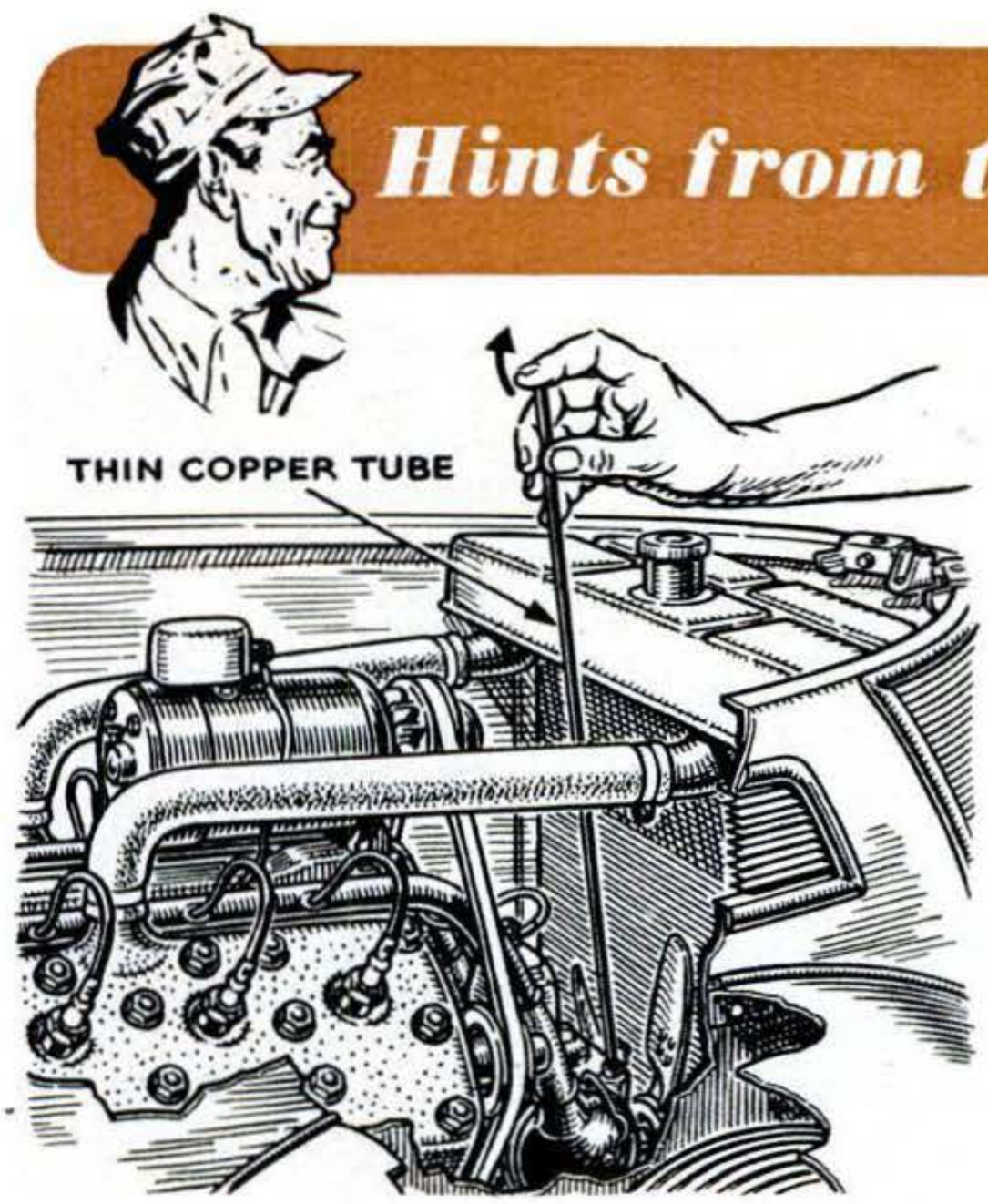
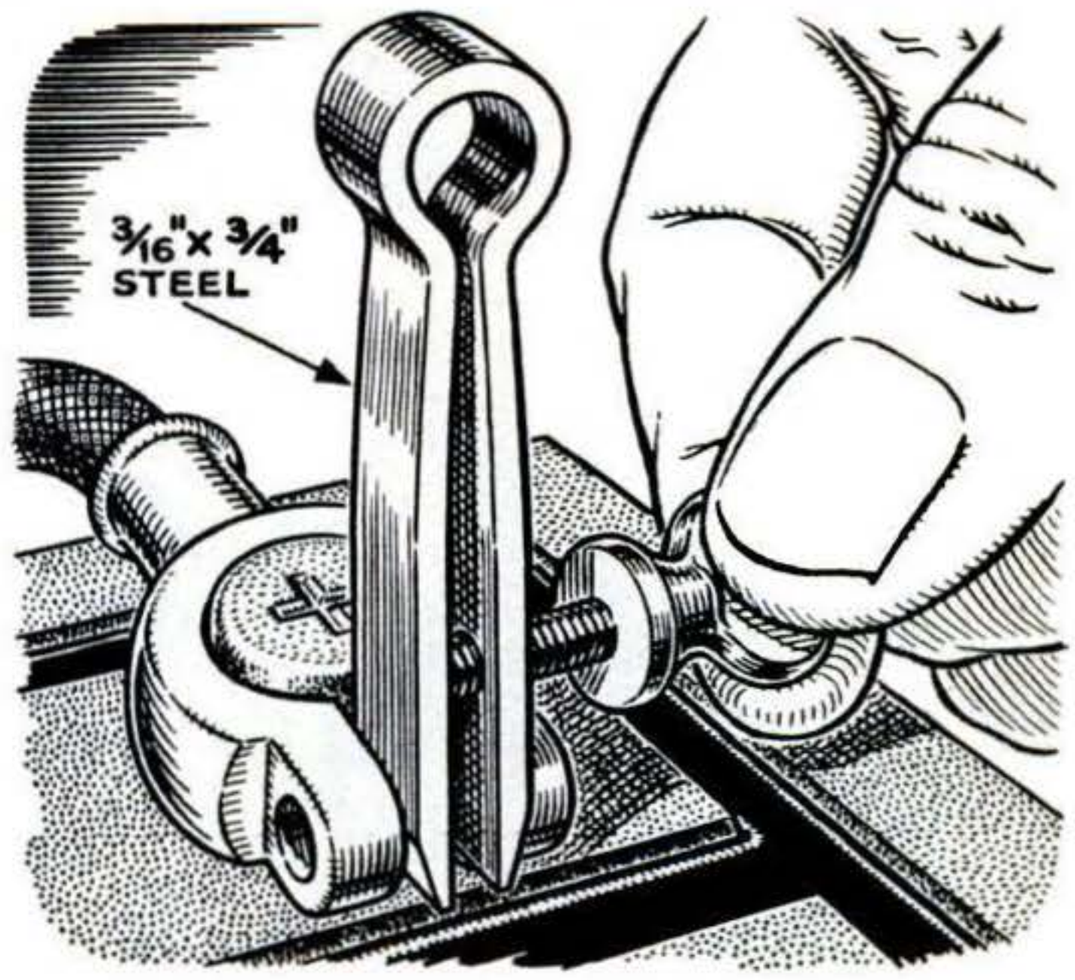
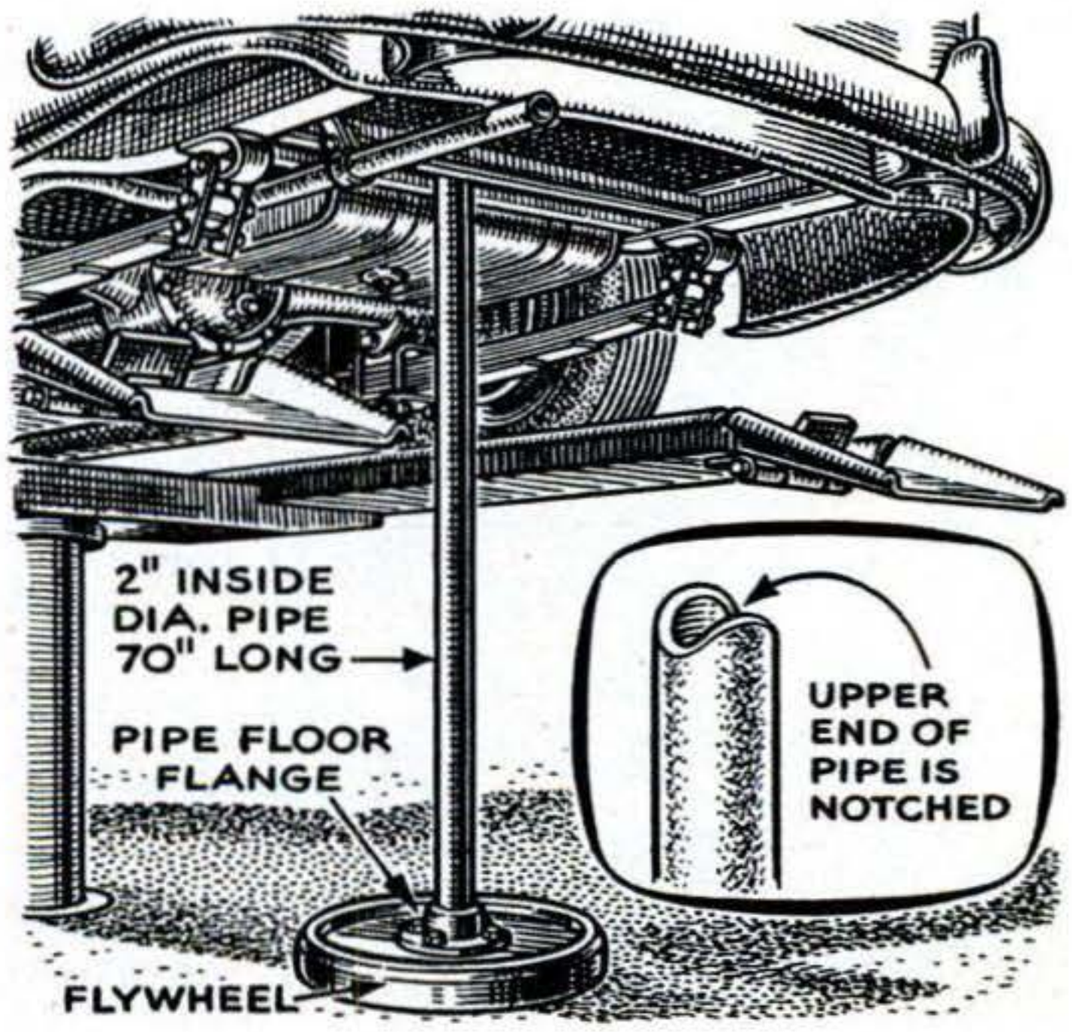
Hints from the Model Garage



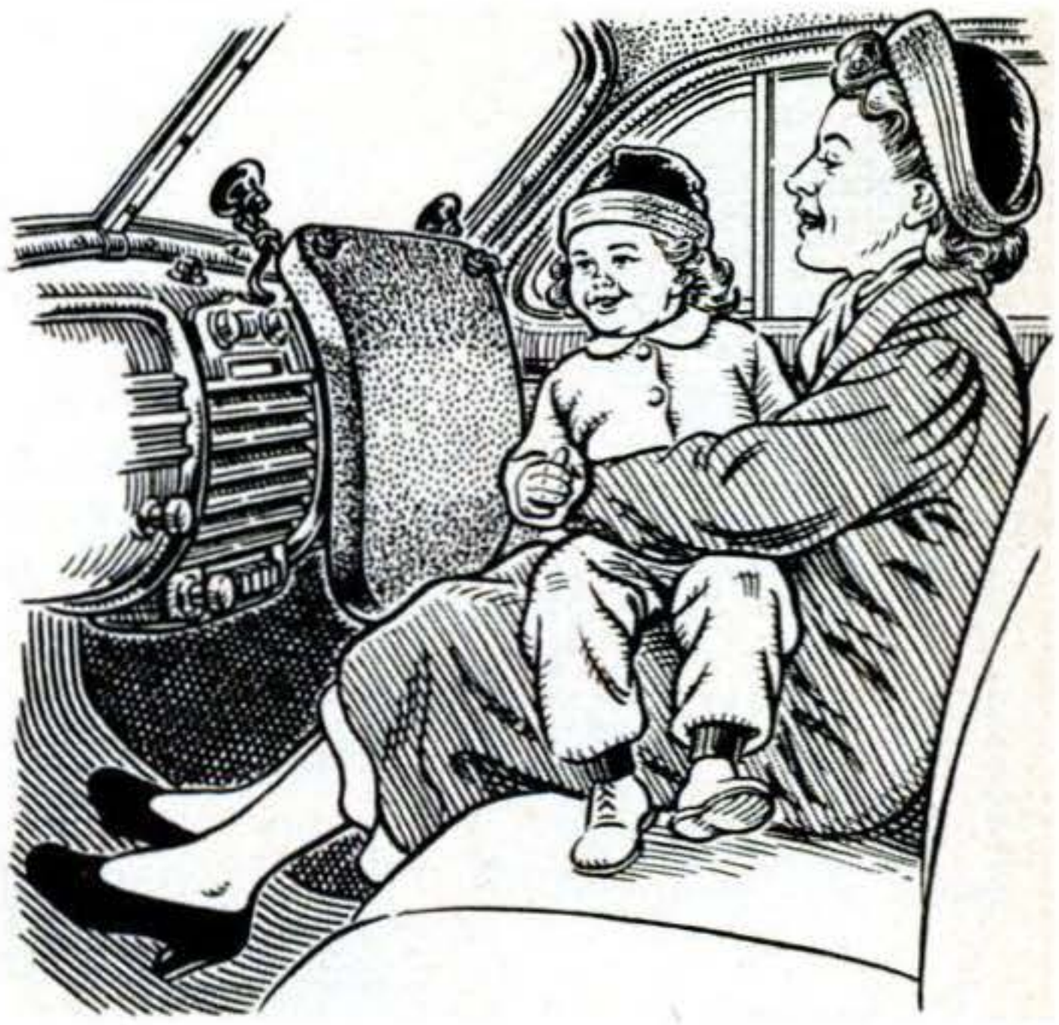
Copper Tube Makes Oiler. To get at those hard-to-reach oil fittings, try this: dip some copper tubing about an inch into oil. Trap the oil in the tube by pressing your finger over the upper end. Removing your finger releases the oil in the fitting.



Wedge Loosens Battery Clamp. T. E. Waters, of Atlantic, Iowa, made this wedge to open up stuck battery clamps. The chisel-shaped end is tapped between the clamp's ears. Then the thumbscrew is turned to spread the clamp apart.



Stanchion Opens Springs. I really get oil between spring leaves with this stanchion. After the notched upper end is placed under a frame cross member, I lower the lift a couple of inches. This takes some of the load off the springs and the leaves open. You can almost pour oil between the leaves.—*Marion Rhodes, Knightstown, Ind.*



Rubber Pad Protects Kids. Sudden stops often result in bumped heads. A foam-rubber seat pad and two suction cups, mounted as shown, makes a practical dashboard guard. At the upper corners of the pad, punch holes with an ice pick. Tie heavy cord to each cup and run the cord through the holes. Large knots will hold the pad in place.

Turn the Page for Three More Hints

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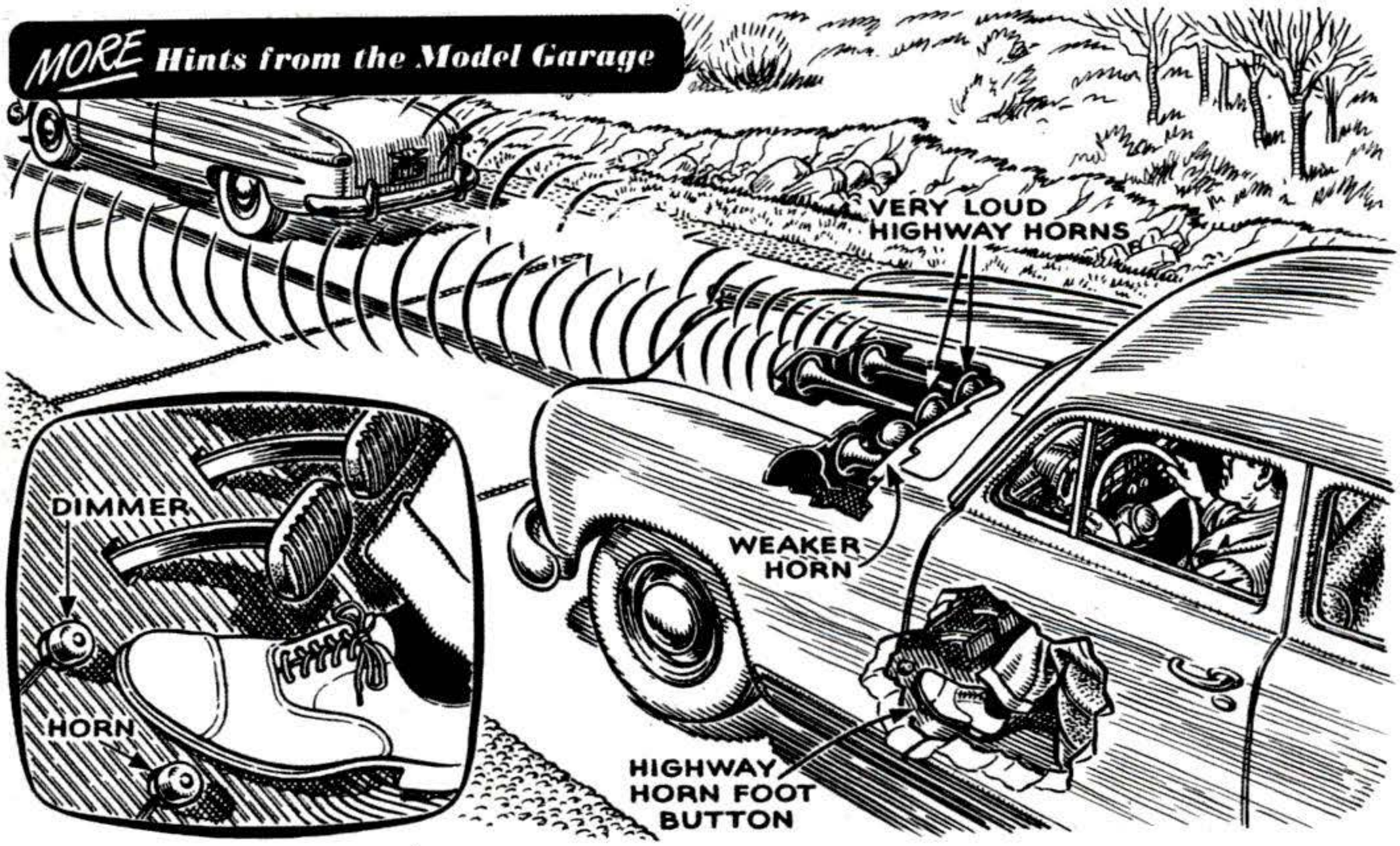
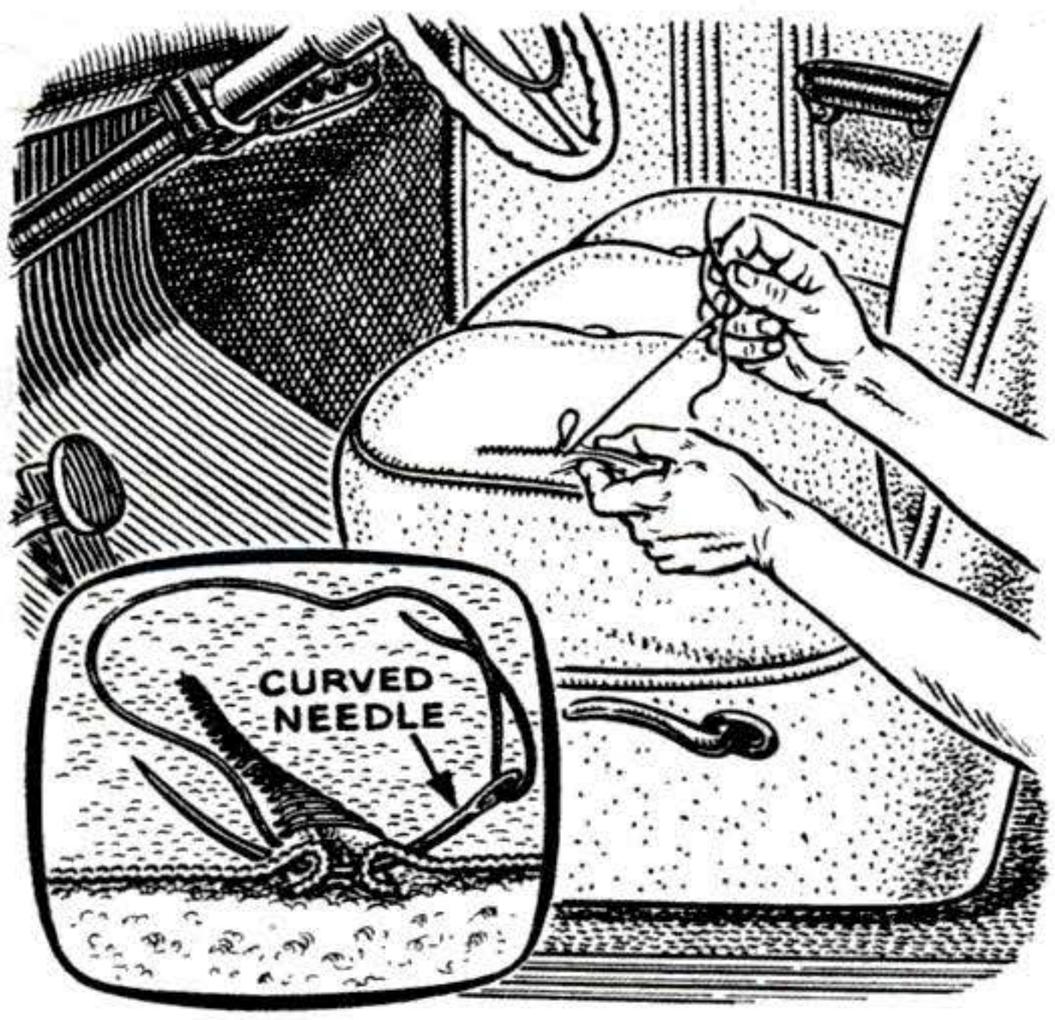
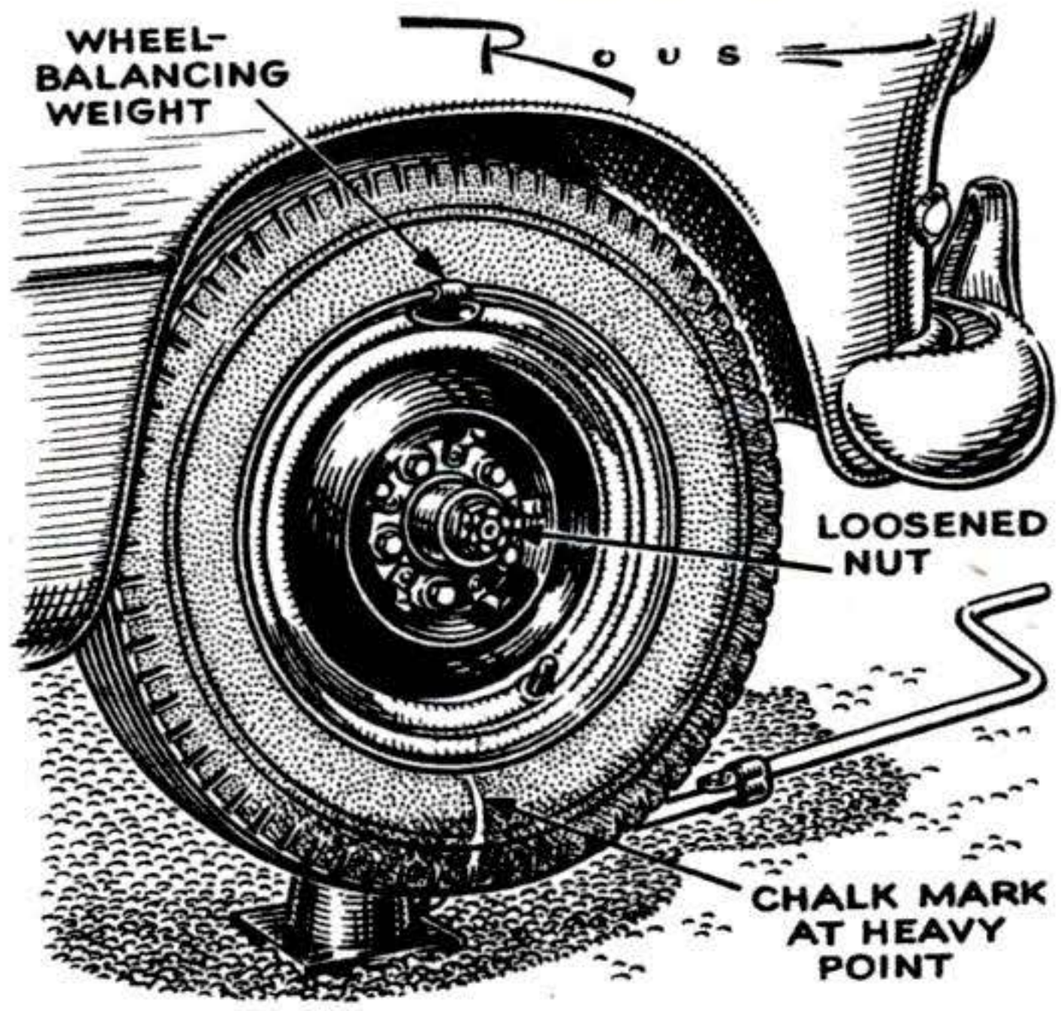
MORE Hints from the Model Garage



Horn Button on Floor. As a safety measure—so I can keep both hands on the wheel when I'm driving fast—I mounted an auxiliary horn button on the floor of my car. For this button, I used a floor-type starter switch. I located the switch near the dimmer switch but far enough away so there's no interference in the operation of either one. The floor button is connected to a couple of loud highway horns. A weaker horn, for city driving, is connected to the center button on the steering wheel.—*J. H. Carll, Hempstead, N. Y.*



Curved Needle Mends Rips. Henry Zave, of Chicago, offers this hint for keeping your car's seat covers and upholstery in repair. Use a curved upholsterer's needle for easier sewing. You'll find this type of needle lots simpler to handle. It's especially good when you have to work from only one side of the material.



Balancing Auto Wheels. Mount the wheel on the front axle. Back off the bearing nut. Spin the wheel and mark with chalk the bottom point when it stops. Repeat for accuracy. Opposite the mark, mount a wheel-balancing weight. Continue to spin it, using lighter or heavier weights until the wheel has no heavy point.—*W. M. Dierks, Chicago.*

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Pasteurize Your Own Milk

To PURIFY raw milk and cream, the rural housewife just turns a switch on the new table-model Safgard® pasteurizer above. Electric coils heat a milk container that is immersed in water. Made by Guard-It Mfg. Co., of Chicago, the home pasteurizer holds from two quarts to two gallons and is said to kill up to 99.9 percent of the bacteria.

Jet Cleans Venetian Blinds

YOUR Venetian-blind laundry man won't have to take apart the blinds you send him if he uses the new Jetmatic® cleaning machine shown above. Spraying the blinds with lukewarm water and a detergent, the washer removes all dirt and grease, according to the manufacturer, the L. C. Robinson Manufacturing Co., of Indianapolis, Ind.

Plastic Teeth Hold Towels

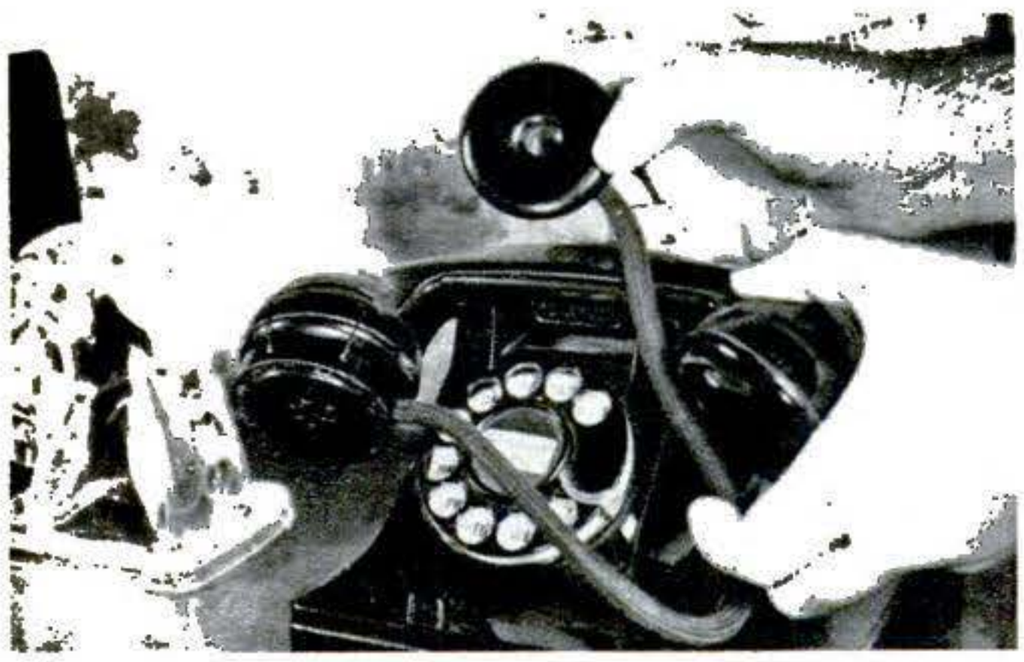
PLASTIC teeth on this new towel holder have a bulldog grip—but a flip of the handle-like head snaps it open and it lets go. The Grip-Hook® is recommended for holding hats, towels, and aprons. Wet washcloths are said to hang looser, dry faster. The manufacturer of the holder, Beaman Plastic Products Co., of Portland, Ore., prices it at 25 cents.

Spear Cooks from Inside Out

WHEN a potato or roast is speared with the aluminum "pencil" below, the food is said to cook faster. In an oven, pan, or pressure cooker, the spear picks up heat and carries it through the food to cook it from the inside out. The Kook-Kwicks®, made by the S.O.S. Machine Works, of Minneapolis, Minn., are said to cut cooking time as much as one-third.

Derrick Cart Has Biggest Tires

It takes a real wagon to move oil-well derricks from one drilling location to another. The one above, built for the Arabian American Oil Company's desert operations, has the largest tires ever made commercially. Each of the Firestone 36.00 x 40s is 9½ feet in diameter, weighs 3,646 pounds, and can carry a 55,200-pound load.

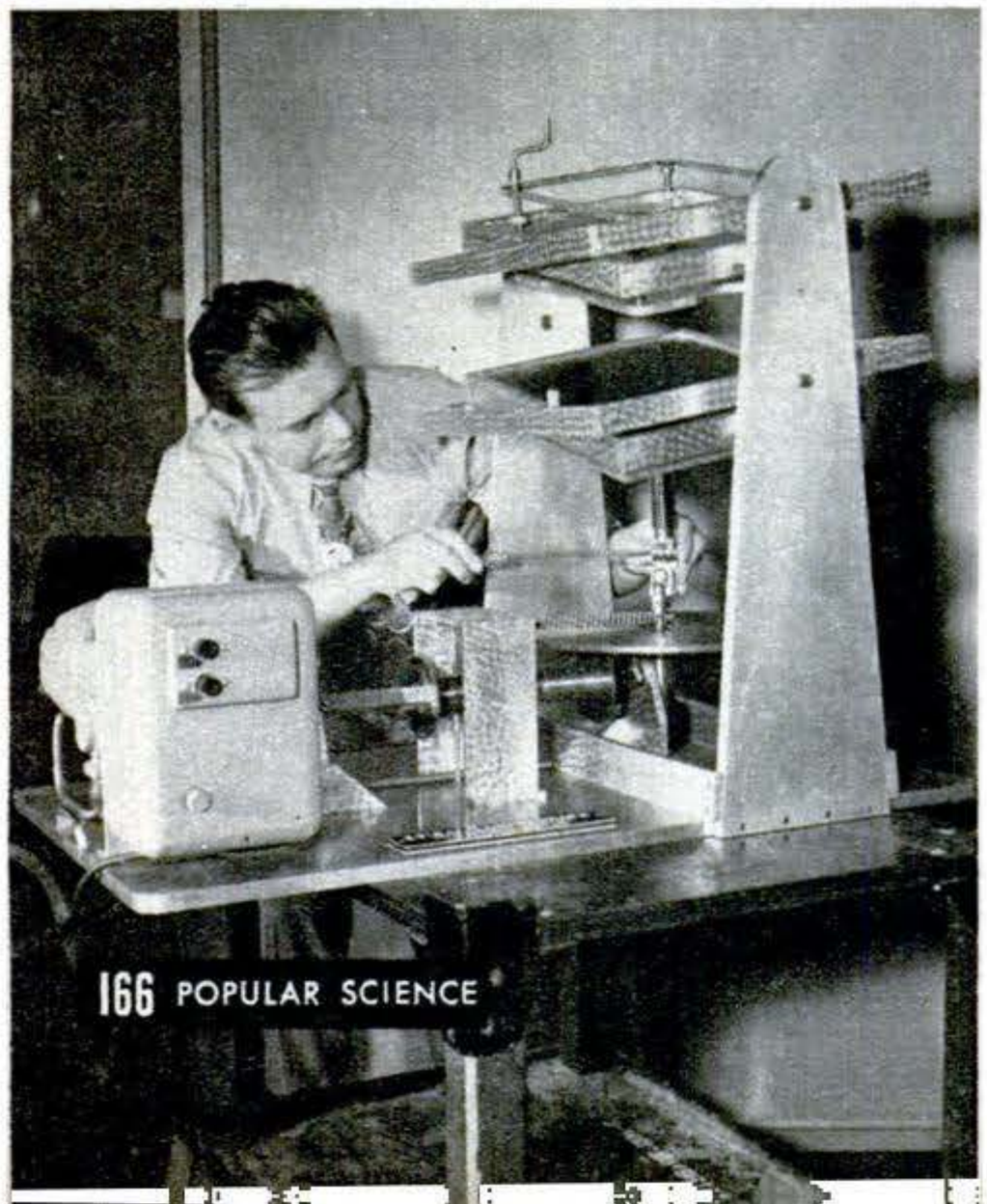


Phone Receiver Serves Two

Two people can listen in on the same telephone with a new device that slips over the ordinary receiver. The Twinfone® consists of two plastic caps connected by a hollow, flexible tube. One cap snaps on the receiver, but does not interfere with its use. The other is held to the ear of the other listener. The device, made by Telephone Devices Co., New York City, can also be used by one person who wants to listen with both ears.

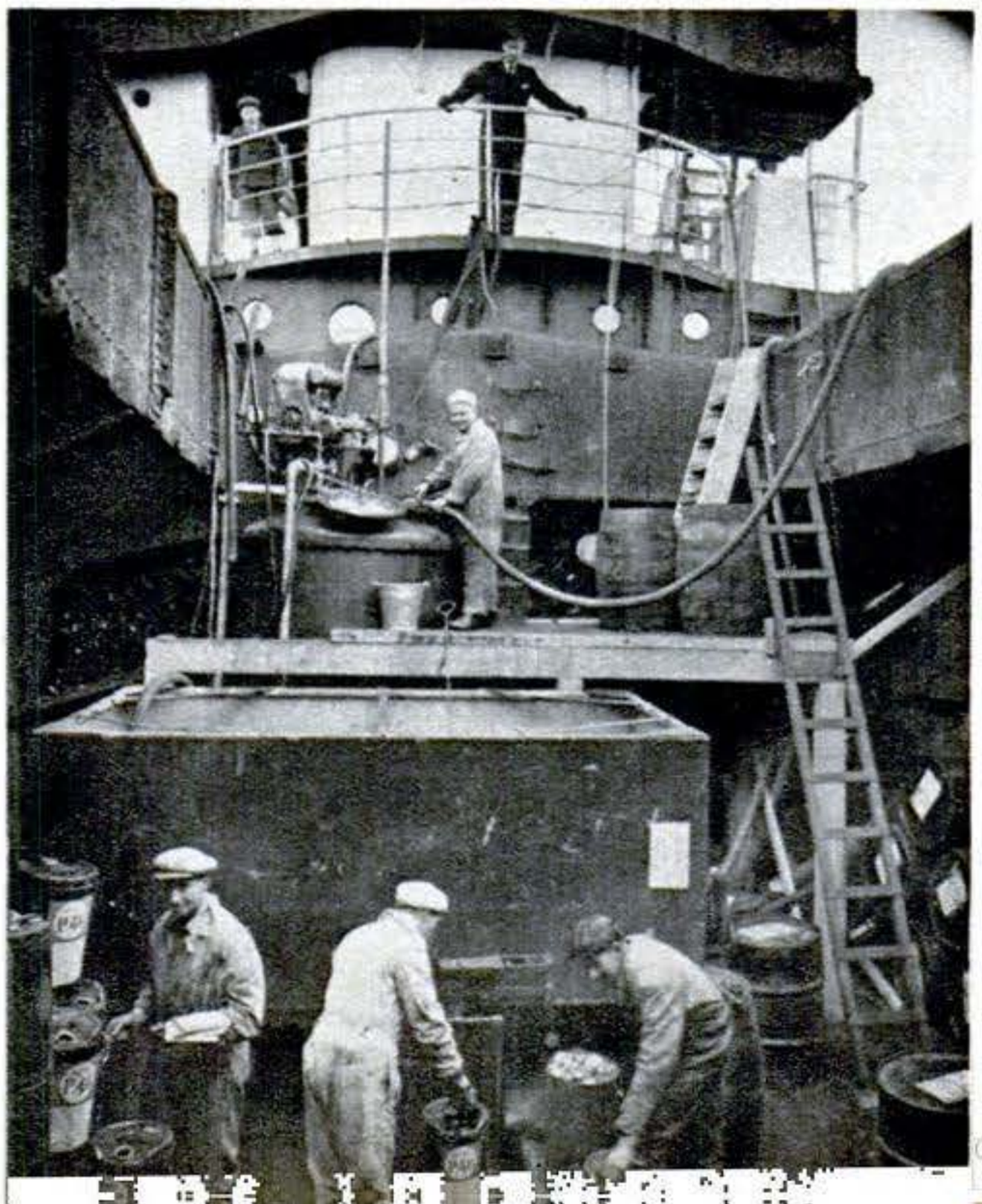
X Ray Gets Sharper Eyes

With this "spiral laminagraph," X-ray technicians at the Naval Ordnance Laboratory see only what they want to see inside metal parts. It tilts the film and sample so that all planes except the desired one are blurred out by a spiral motion. It's like snapping a crowd in which only one man stands still. He will be in focus; the others will blur.



Factory Ship Makes Chemicals

Instead of shipping its products to customers, a British firm ships the factory and makes the product at the customer's door. The 600-ton ship *Tommeliten* recently docked at Gothenburg with a complete plant in its hold (below) for making weed-killing Phenoxylene® for Sweden, which uses too little to justify building a factory there.



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Mechanics and Handicraft

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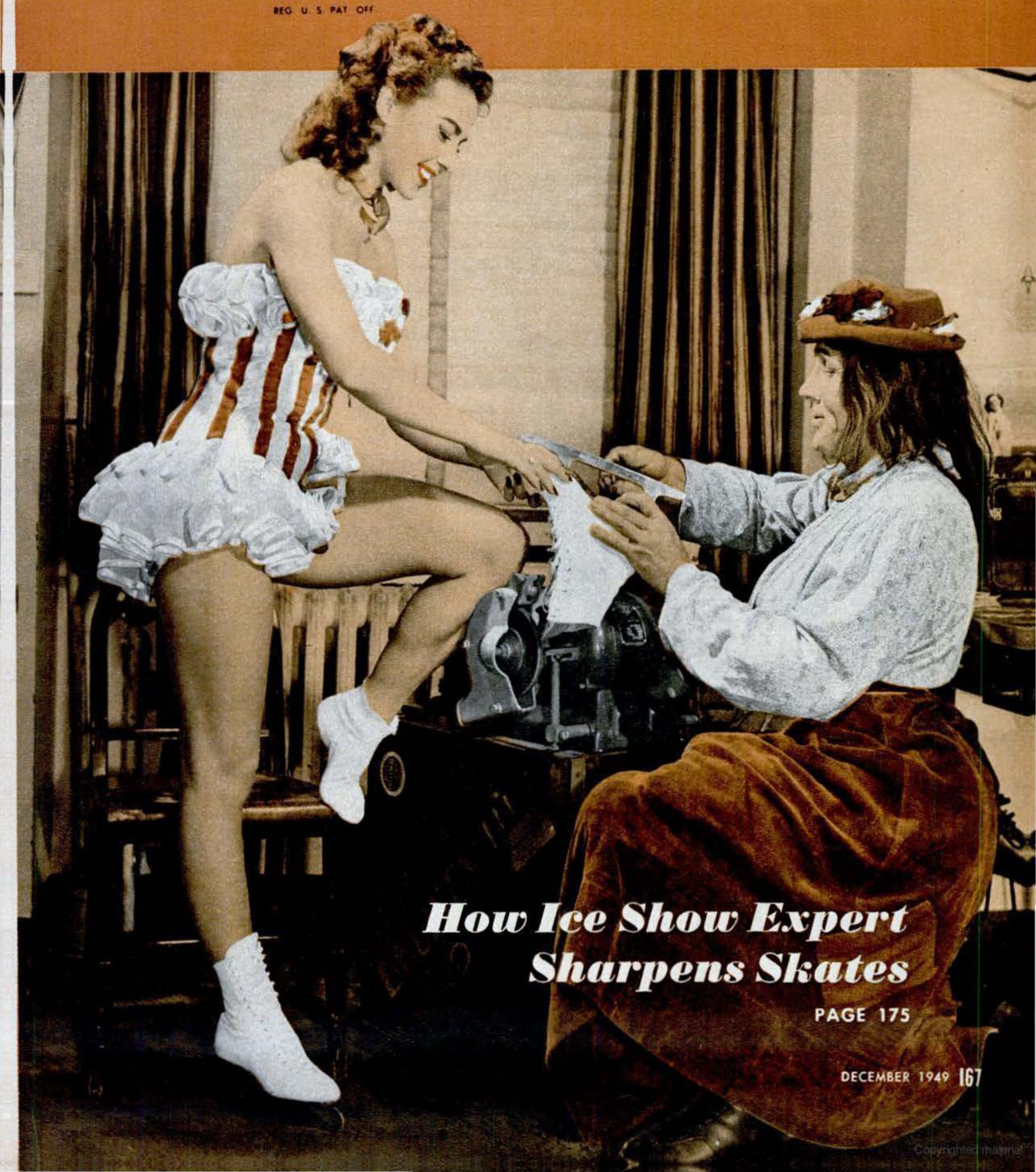
Last Minute Christmas Ideas PAGE 202

Brasses For Your Furniture PAGE 211

Black Prints from Color Photos PAGE 216

How to Turn Spindles PAGE 225



How Ice Show Expert Sharpens Skates

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Lightest Model Planes Fly on Wings of Film

 Photo from Model Airplane News

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Snootiest of models, microfilm planes weigh less than an ounce, fly half an hour—and can be built for a nickel.

By Devon Francis

PS photos by W. W. Morris

A FEW months ago a group of men, breathlessly watching a model airplane fly, suddenly broke into an Indian war whoop. A slight, thin-featured chap named Pete Andrews had accomplished what the world's snootiest group of model-plane builders had been aiming at for 15 years—he had flown a rubber-band-powered microfilm job for more than half an hour.

The exact time—32 minutes, 19 seconds—was an international record. It was established in a blimp hangar at the U. S. Naval Air Station at Lakehurst, N. J.

Microfilm-model flying gets its name from the ultrathin, transparent film, called microfilm, that forms the "fabric" that covers the wings, tail, control surfaces, and even the propeller. It is an acetate-base solution containing thinner and a plasticizer to give it elasticity. You can buy it ready-mixed at hobby shops or mix your own, as Andrews does. In either case, it forms a film so thin as to defy measurement by ordinary means.

The little planes weigh only a small fraction of an ounce, including their rubber-band motors. Incredibly fragile, they must be flown indoors under still-air conditions. There are only 3,000 active microfilm-model builders in the U. S., compared to the hundreds of thousands of model-plane enthusiasts. The work is too exacting for the average putterer.

But in cost of materials, indoor model flying probably is the cheapest hobby known. Andrews' title-holding airplane, spanning 32 inches with a length of 28 inches, cost a total of five cents. He can build such a craft in three to four hours with the deftness that comes from 20 years' experience. The unpracticed hand will do well to turn out a microfilm model in eight hours.

The secret of microfilm-plane performance is good design, light construction, a rubber band that will take several thousand twists without breaking—and plenty of indoor space with a high roof for the plane to maneuver in. The plane's flight divides into a climb stage, with the propeller turning about 80 r.p.m.; a cruise stage, where it turns 60; and a gliding stage, where it turns 40. A slight bank is set into its flight by a rudder adjustment. That makes it fly in circles. Its speed is a slow walk, about 2 m. p. h.

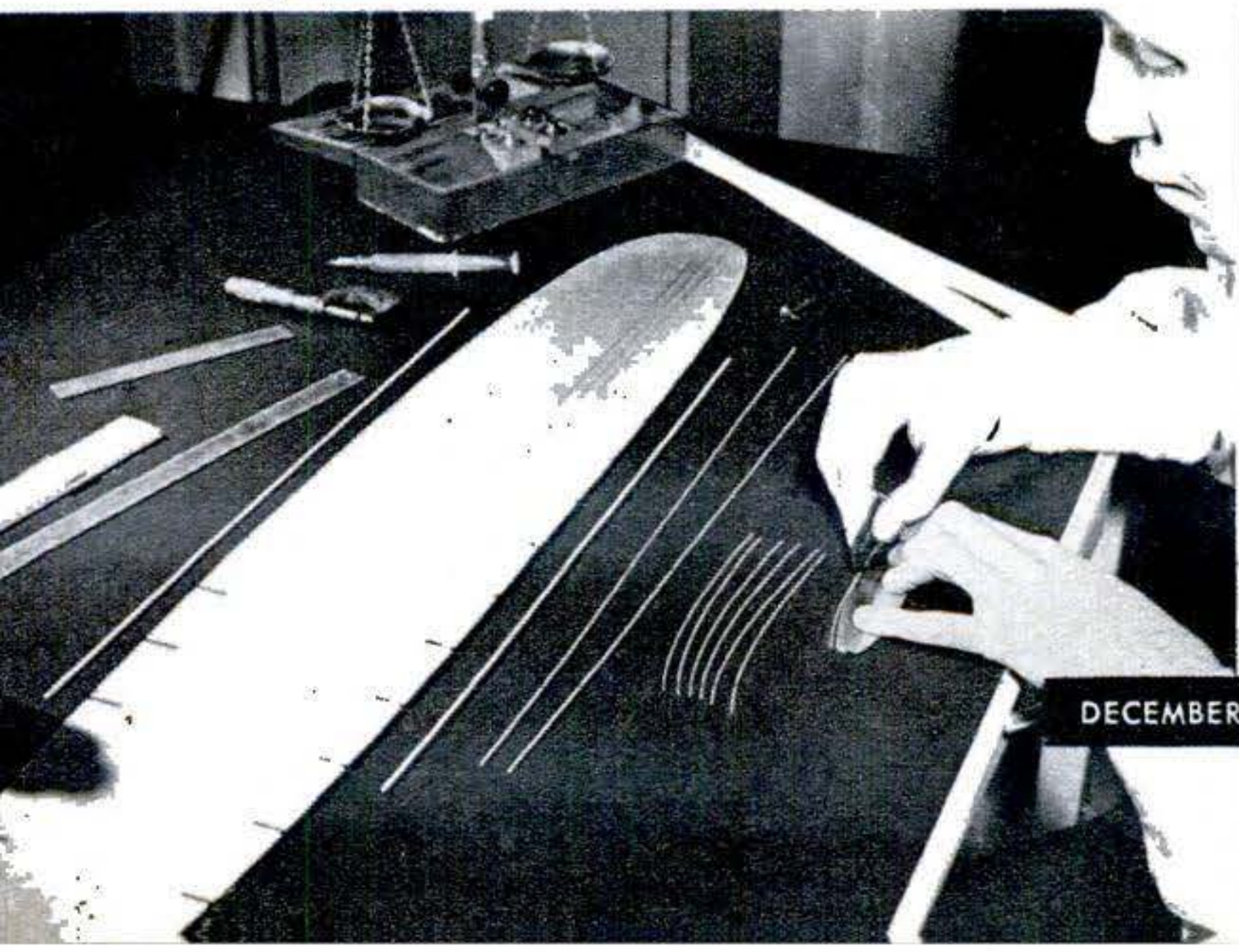
Microfilm-model builders are a serious group. They even have their own low-speed wind tunnel at the Massachusetts Institute of Technology—circulating air at 3 m. p. h.

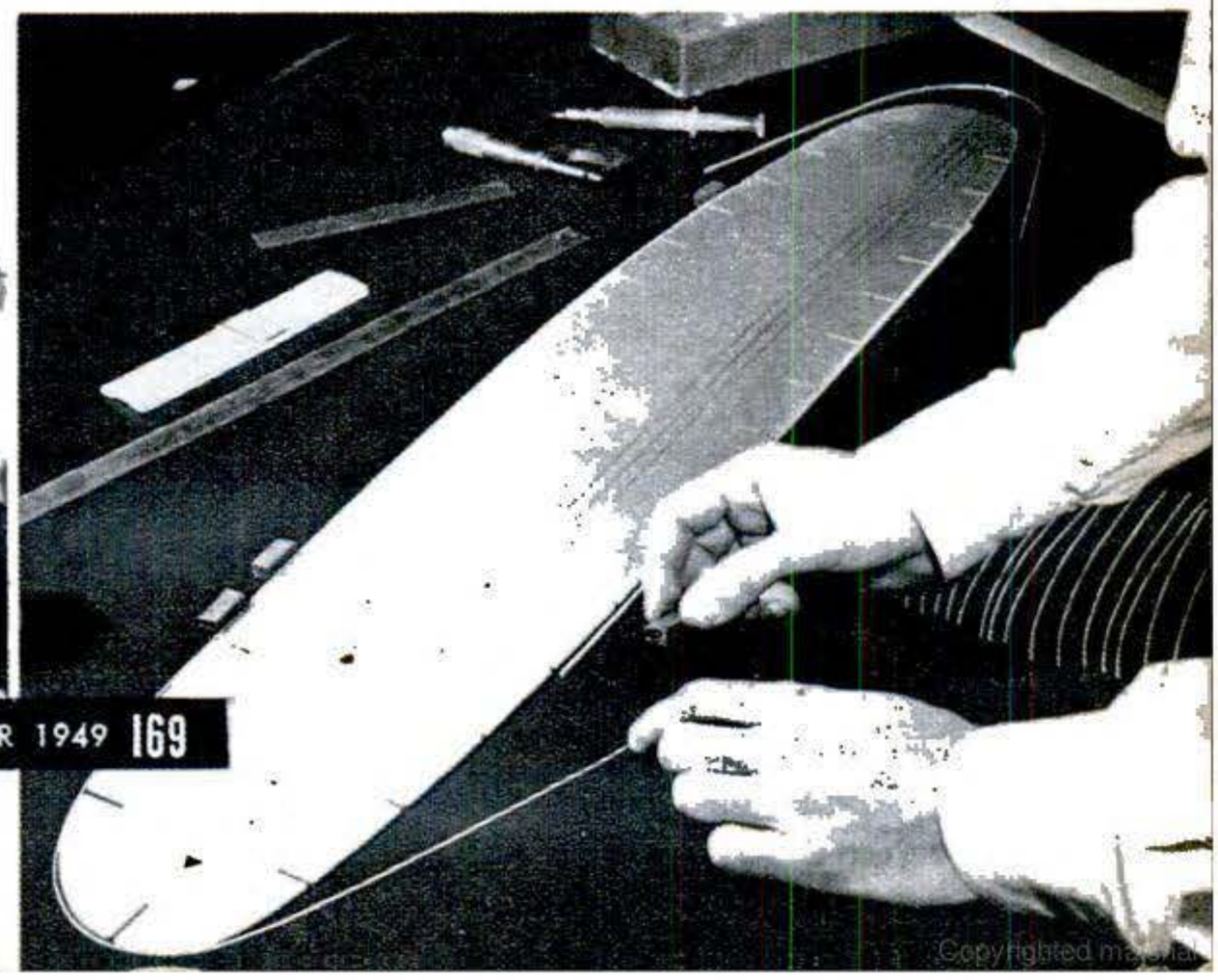
And the experts have no secrets from each other. When Andrews discovered he could make a prop of microfilm on a balsa-wood framework, saving hours of labor on a solid prop, he promptly published his findings for everyone to copy. His closest competitor in this country is Frank Cummings, who has come near to the 30-minute mark himself.

The photos on these pages show how an expert builds a microfilm plane. Patience is his greatest virtue. Pete Andrews worked and posed for two full evenings in front of a PS camera for these pictures.

1 **First step** in an expert's construction of microfilm plane is cutting thin strips of balsa wood for wing's spars and ribs. Spars actually form wing's outline. Balsa stock runs from 1/64 to 3/32 in. in thickness. It is purchased in widths of 1 in. and lengths of 18 in. Spar stock is cut 1/32 in. thick and 1/20 in. wide. Stock used for the wing tip and rib is 1/32 in. square.

2 **Weights hold balsa** in position while strips are glued together. Tools used also include razor blade, micrometer, ruler, weighing scale, tissue paper, wood dowel, glue or cement, hypodermic needle, round-nose pliers, and wire hoop. Materials are balsa, microfilm, tungsten or nickel-chromium bracing wire. Wing template is homemade. Slots indicate rib positions.

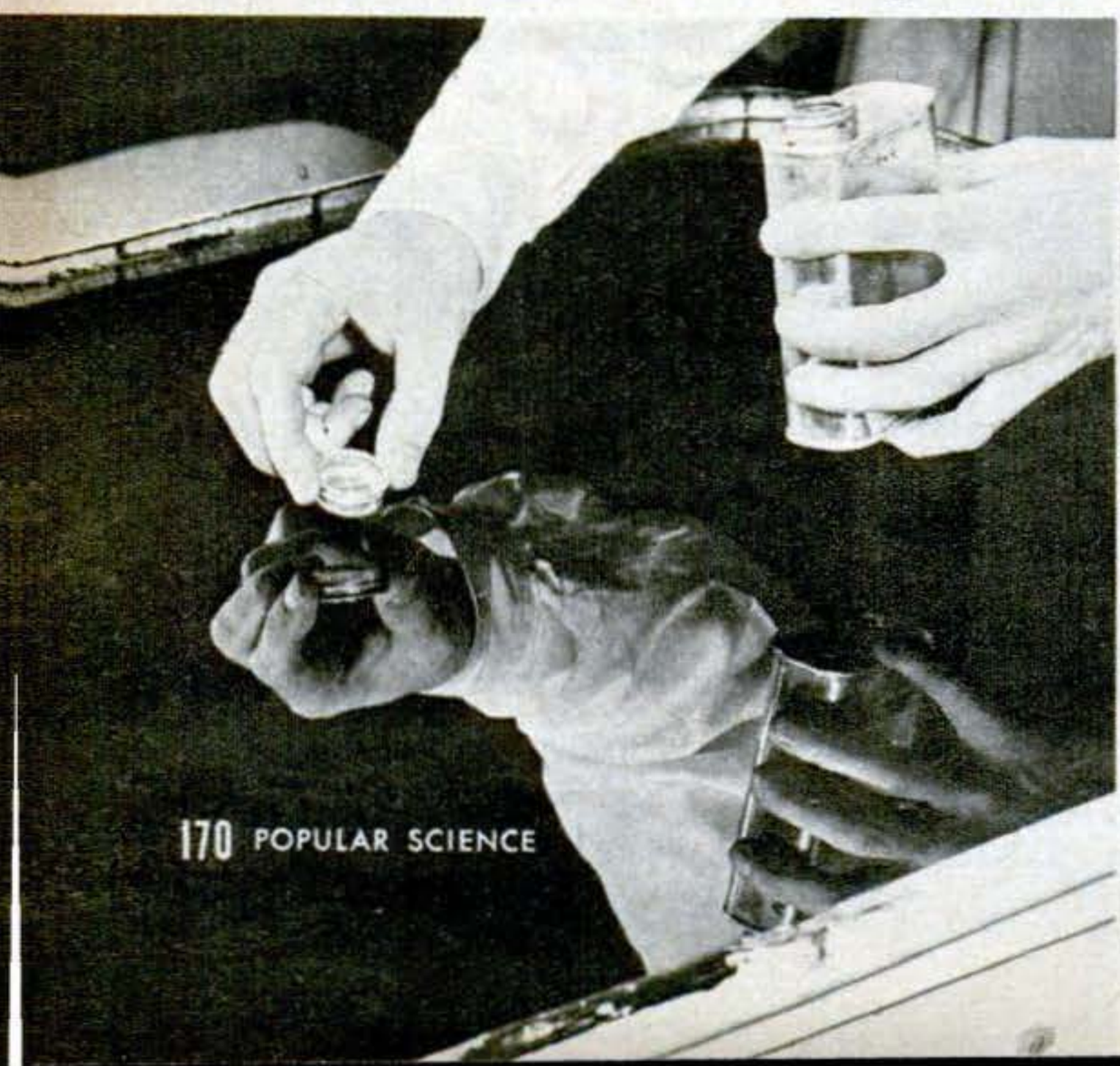




3 Ribs are cut slightly longer than necessary and razor-trimmed at moment of gluing to spars. Regular hobby-shop glue dries almost instantly. Fragility of balsa requires steady hand. This 32-inch wing is a duplicate of one with which Andrews set international duration record. It has 147 sq. in. of wing area. That rates it as Class C model. Four competitive classes recognized are A—up to and including 30 sq. in.; B—31 to 100; C—101 to 150; and D—151 to 300.

5 For plane's "fabric," water is poured into large, shallow pan. After all ripples have quieted down, acetate-base solution is then measured into can cap and slowly introduced to surface. Like a thin oil, film spreads itself. It weighs 1½ thousandths of ounce to square foot.

6 Film jells in a moment. Wire hoop is laid carefully on top of film. Film's thickness is judged by its color in reflected light. "Heavy" film looks dark red. Progressively lighter films are apple green, light red, light green, gold, violet. Film without color is too thin to use.



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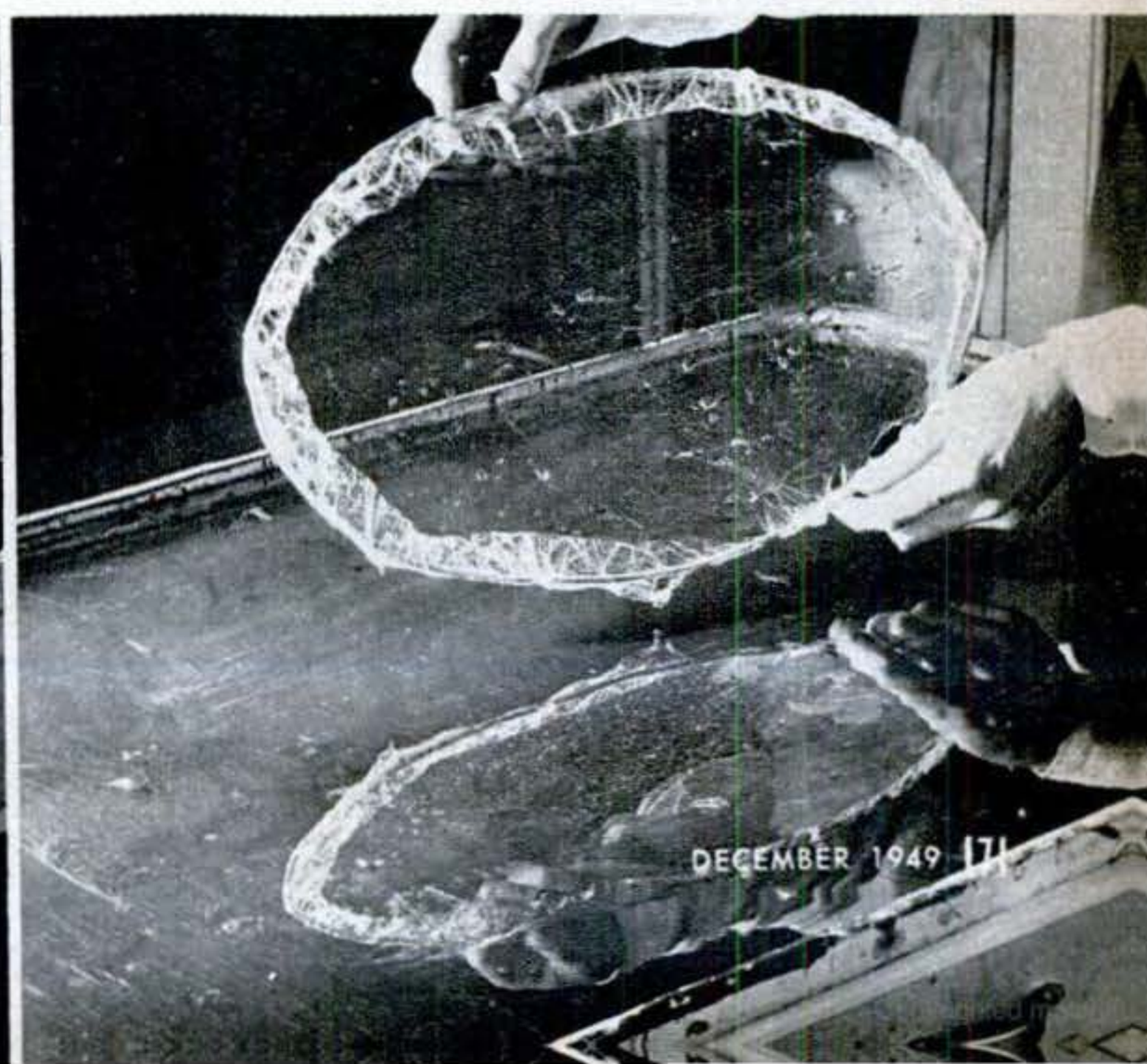
4 Next step is removing wing structure from template. Designer-builder Andrews will wet spars and ribs lightly with water to receive filmy wing covering. Film has affinity for anything wet, will stick readily without glue. Plane's completed weight, including rubber-band motor, will be 6/100 of an ounce. Motor itself weighs just half that. Andrews says successful microfilm-model builder should have a good working knowledge of physics, chemistry, math, *and* aerodynamics.

7 Film is captured by folding its edges over hoop. Experts are careful to keep out drafts during this step to obtain even thickness, flawless surface. Andrews mixes own solution, uses a minimum of plasticizer. A too-elastic film tends to pull on the frame of the airplane and warp it.

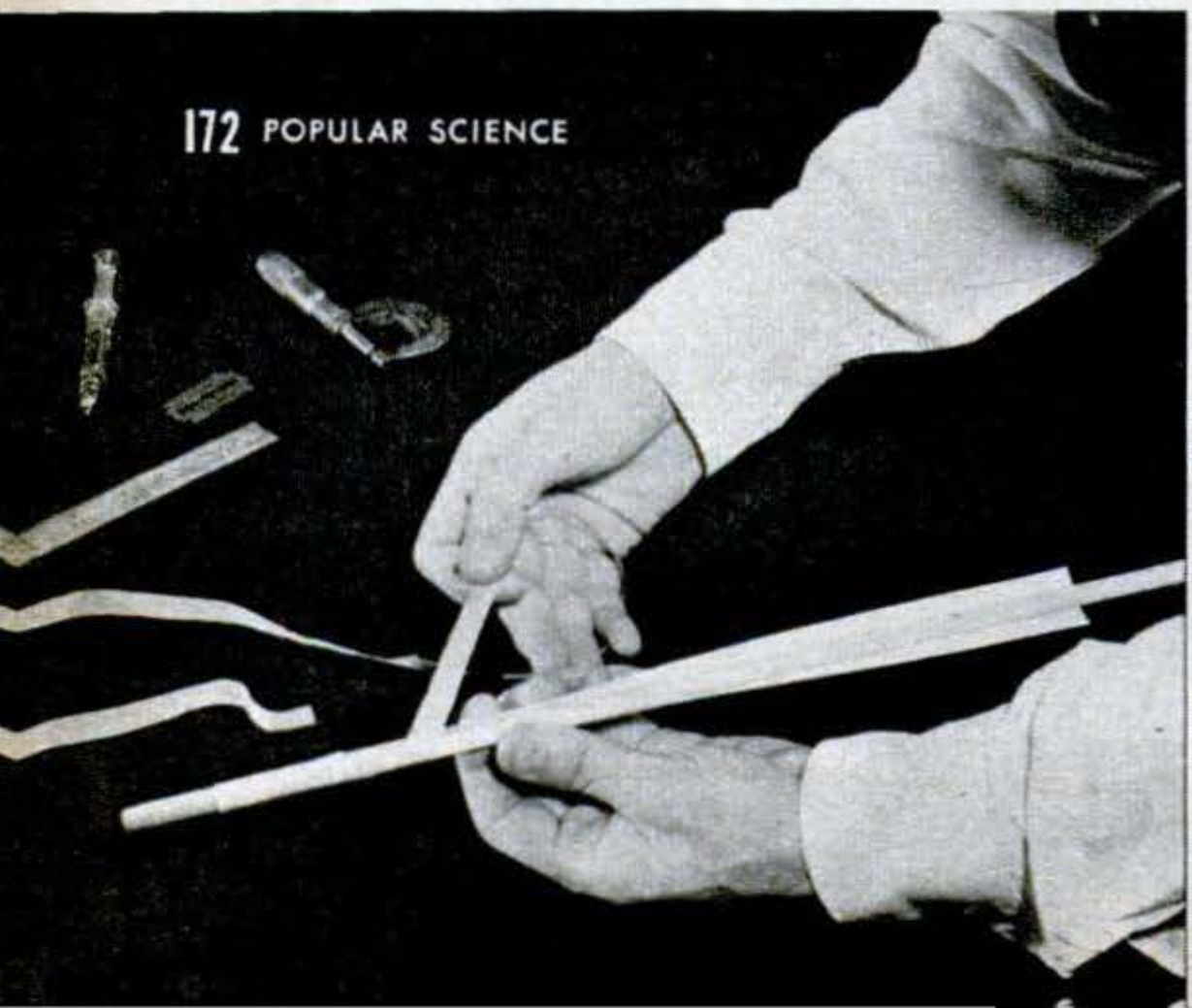
8 Transparent airplane covering is lifted from water to be put aside for drying, which requires about three hours. Single piece of film customarily is used for one covering job, such as on wing. Andrews here uses a small hoop to demonstrate technique of making "fabric."



9 In applying film to wet framework, hoop is supported at ends by cigar boxes so film will take on curvature of wing ribs. It is trimmed to outline of wing by cutting with pencil soldering iron. Andrews will go over it a second time with iron to remove any rough edges. Water beaker is kept handy in case part of framework dries and film refuses to stick to the balsa wood.

10 "Fuselage" of model plane is also made of balsa, formed by wrapping moistened strip around a wooden dowel. Spiral of tissue paper holds it in place. Balsa is "set" by putting it in an oven for five minutes at 450° F. Tailplane, circular rudder, and propeller are made like wing. Despite delicacy, microfilm planes can undergo collisions in flight and bounce away undamaged.

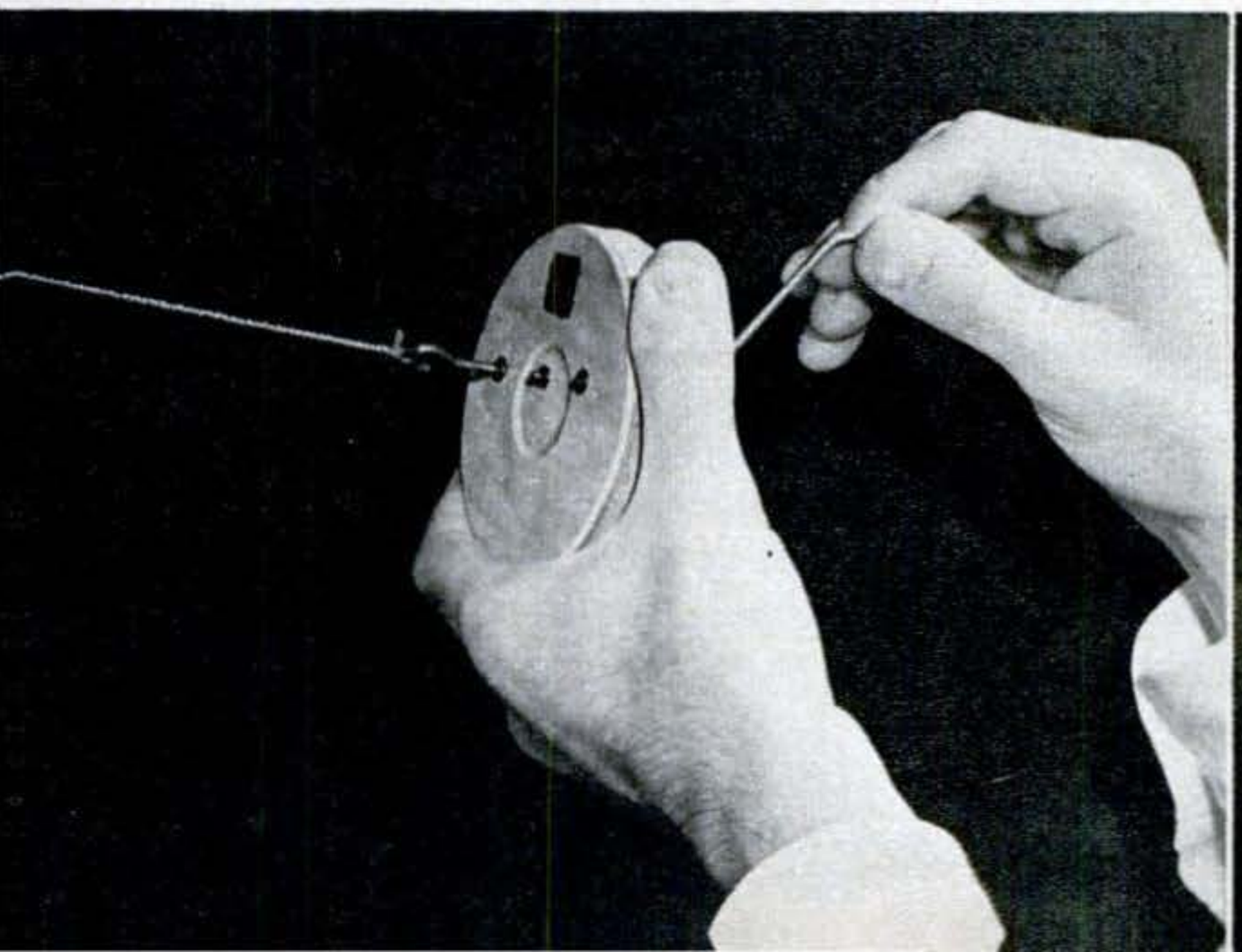
11 Final operation on fuselage is gluing tube together with hypodermic needle, boring two tiny holes in it, inserting tissue cups in them to receive balsa supports for wing, and attaching hook to hold rear loop of motor. Andrews is vice president of a Long Island company manufacturing dies for drawing metal. Chief expense of his hobby: traveling to model meets.

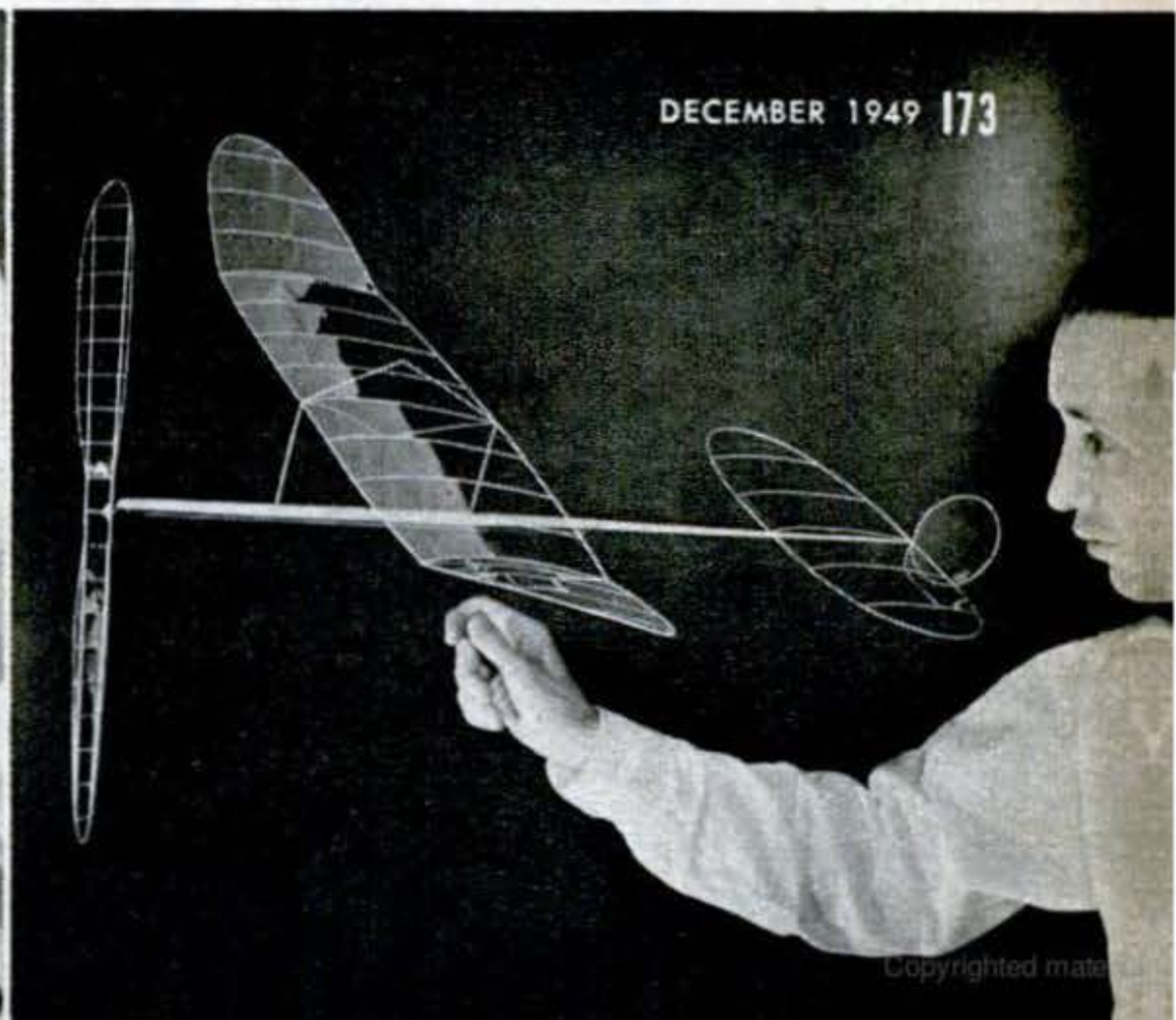


12 Plane is ready for competition. Dihedral at wing tips, necessary because there are no ailerons, is worked into framework by breaking wood after assembly and re-gluing. Wire supports for wing, like those on World War I planes, are half the diameter of a human hair, weigh 3/10,000 of an ounce. For travel in cardboard box plane comes apart in sections.

13 Motor is a special rubber called T-56. It is standardized at a thickness of 1/32 in., but its widths run from 1/32 to 1/8 to accommodate planes of different sizes. Two strands of it 15 in. long will take 2,400 turns without breaking. Model-plane flier meticulously counts his turns on this 20-to-1 winder (below). Soap-emulsion lubricant is put on rubber to reduce friction.

14 Launching microfilm plane is simplicity itself. Let go of the prop and give a little push. Flights ordinarily are made in 30-foot circles. Andrews achieves a semi-constant-speed propeller by making framework in leading edge of the propeller flexible. When prop turns too fast, leading edge bends outward and increases the pitch. Bigger "bite" of air slows it down.





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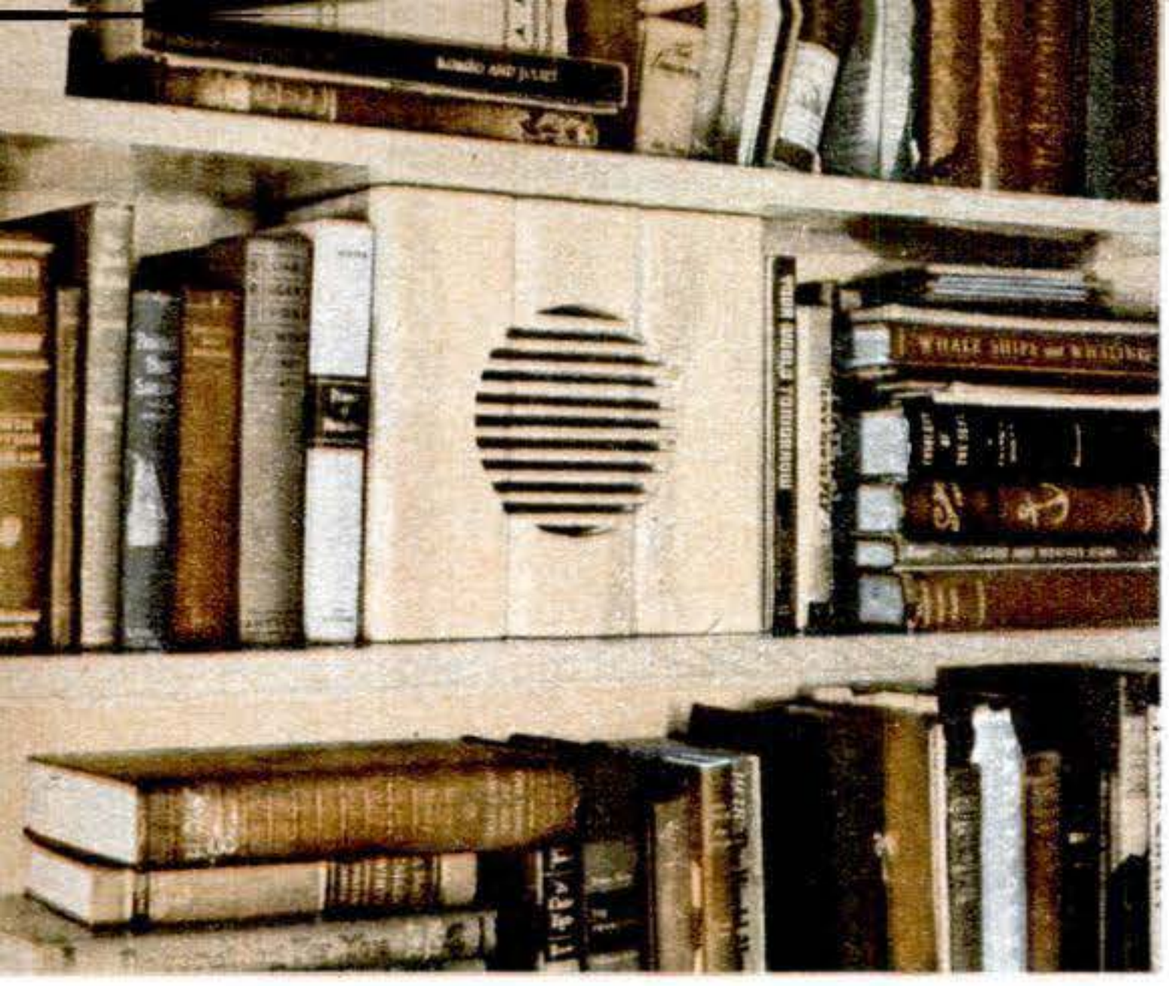
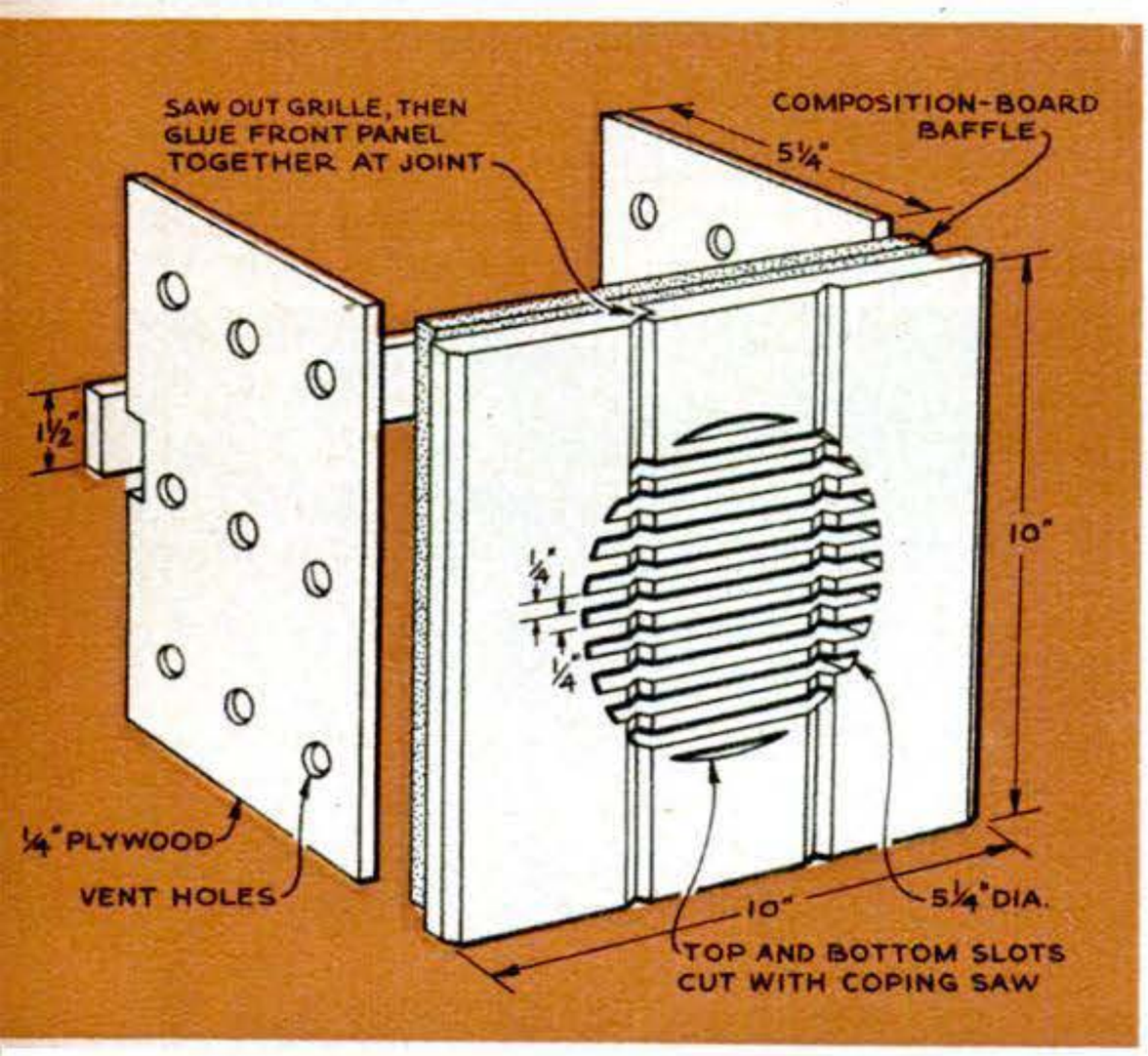


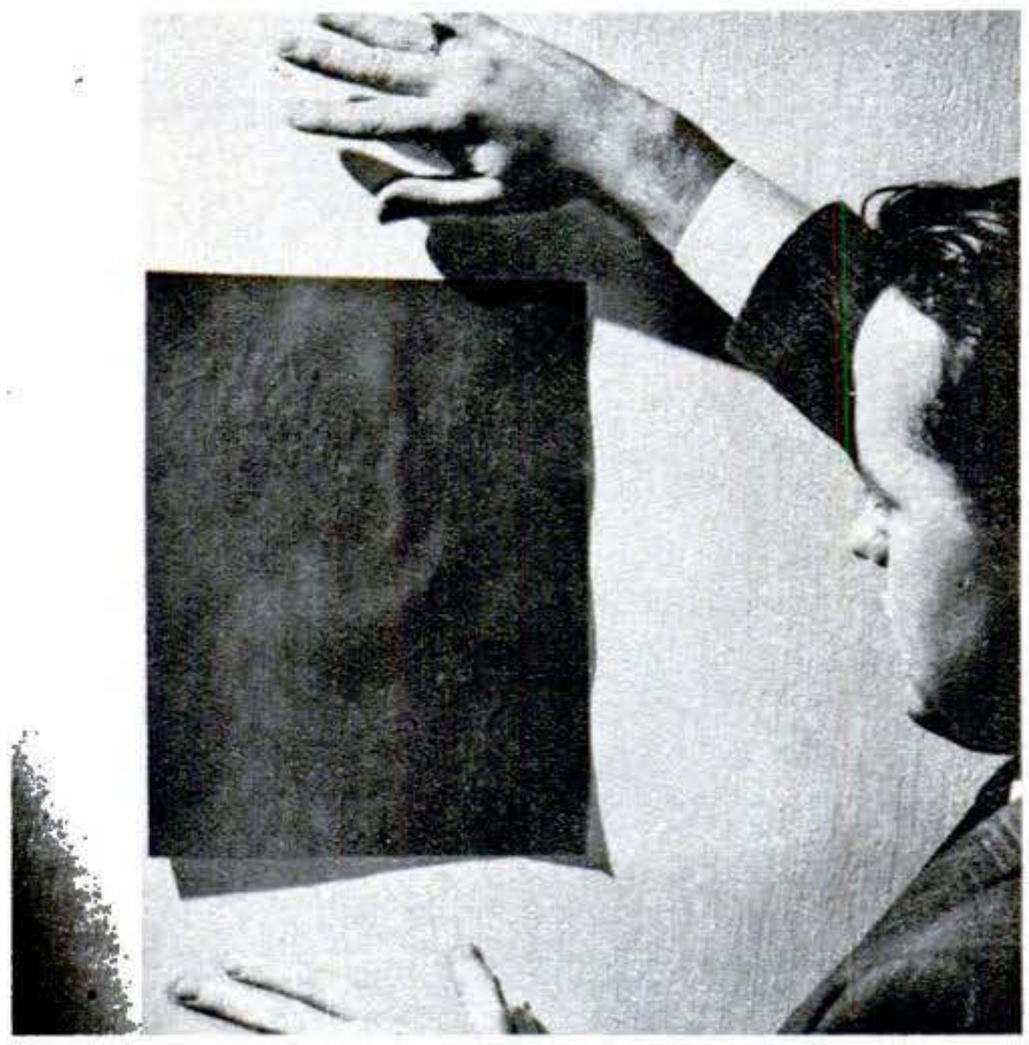
Let Static Help You Entertain Your Guests

Add a Voice to Your Bookshelf

INGENIOUS use of shiplap pine makes this attractive remote speaker for radio or phonograph an easy hand project. The front panel is actually two pieces. One is the full 7" width, with the under lap trimmed off. The other is cut lengthwise down the center groove. Fit the two pieces together, lay out a circle the size of your speaker, and mark horizontal lines ¼" apart. The two pieces then can be separated and the lines cut easily with a bandsaw or by hand. Break and chisel out alternate strips to form the grille, glue the two pieces together at the lap, and sand.

A sound-absorbing baffle with the same dimensions and center hole as the panel holds the speaker. It is screwed to the back of the panel. The sides and brace are attached as shown and the panel finished to match your bookshelf.—*Roland Cueva, Heyburn, Idaho.*





For a really "live" party, try some electrical magic. These two tricks require only paper, metal foil from cigarettes or chewing gum, an egg, and dry winter weather. The-paper-that-sticks-to-the-wall (above) is mystifying—and easy. Just hold the paper on the wall and stroke it a few times with your free hand. Now take both hands away and static attraction will hold it in place.

Challenge your friends to move a strip of creased foil that has been balanced on an egg without touching it, blowing on it, or jiggling the table. When they give up, all you have to do is shuffle one foot on the rug and hold a finger near the foil. The foil will follow your finger, attracted by the static electricity generated on your body when you shuffled your foot.

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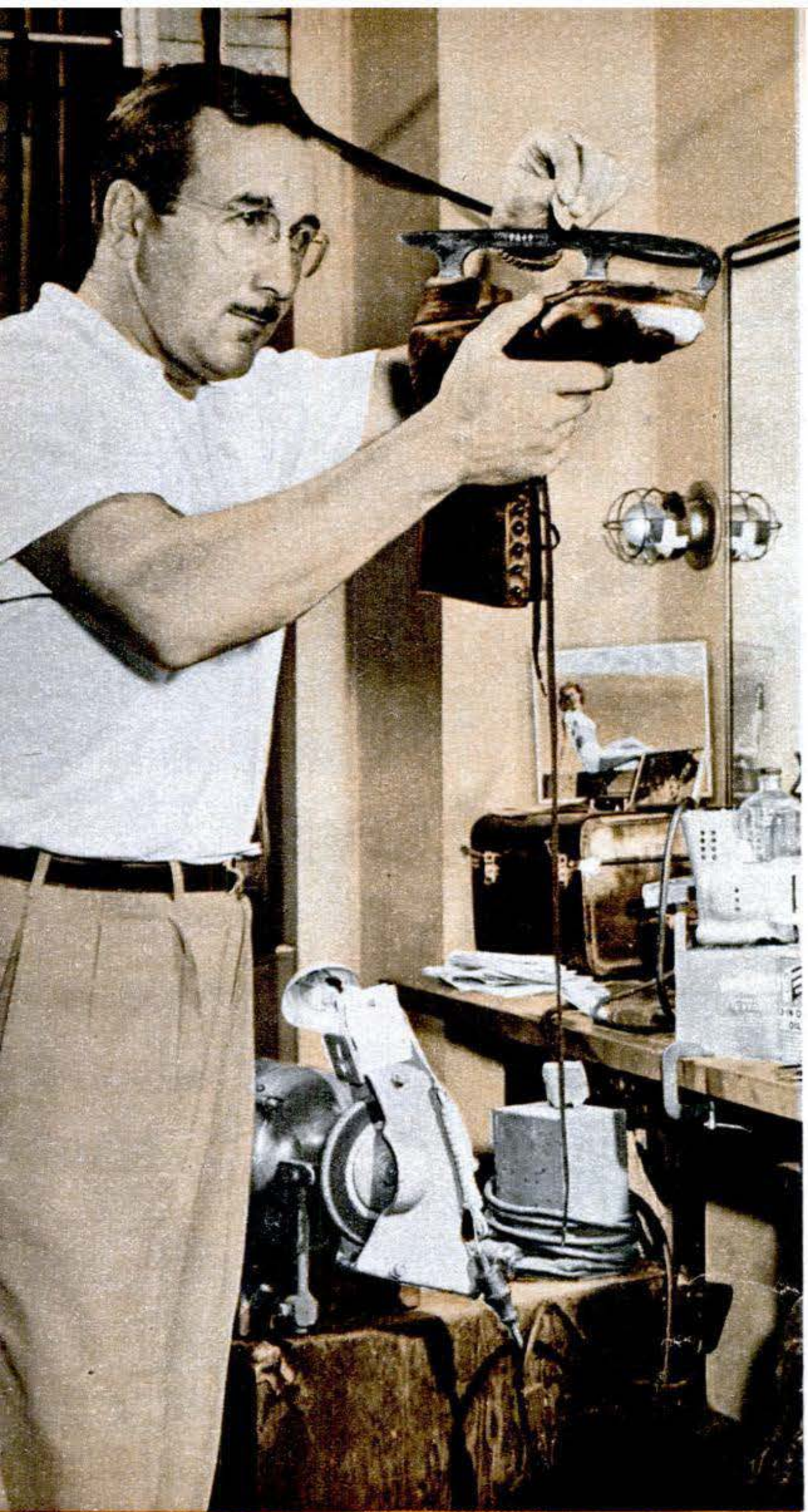

In his machine-shop dressing room at New York's Center Theater, Geoffe Stevens is checking a "half-dollar" hollow of a skate blade before adjusting his grinding wheel to size. One of "The Bruises," in the perennial "Howdy, Mr. Ice" show, Stevens is the same character you saw as a scrubwoman examining the skates of Jinx Clark, featured skater, on page 167. A former member of the British Olympic ice hockey team, he has been skating all his life. His act is so rough on skates that manufacturers with a new product send him their skates to try out. If they stand up under his treatment, they are marked fit for the market. Every year, he wears out four pairs of $100 skates and handmade boots.

How an Expert Sharpens Skates

By Geoffe Stevens, *ice-show star*

PS photos by Hubert Luckett

I GUESS I've sharpened at least 100,000 pairs of ice skates in my time. I've been at it for 20 years, and I should know the job of putting a keen edge on the steel that cuts ice in my business. When I'm not out on the stage on skates, I'm back in the dressing room grinding or repairing them.

For our type of skating—figure skating—the blades are hollow-ground so that they dig into the ice. That calls for a job of precision grinding. Racing and hockey skates, on the other hand, have blades that are ground flat across the bottom so that they will glide over the ice instead of cutting into it.

When a member of the cast brings me a pair of skates to be sharpened, I find out what size "hollow" he wants. I have a set of radius gauges to measure the hollow, but in most cases they want either a "quarter" hollow or a "half-dollar" hollow. That means the size of coin that will match up with the hollow grind along the bottom of the blades. The girls, for instance, use less force for digging into the ice and usually want a half-dollar hollow.

For our rough-and-tumble kind of skating we need a quarter hollow. For the amateur, every-day skater, a dollar hollow will give all the grip he needs. The important thing in grinding is to get both edges of the hollow even. And it's the inside edge that causes the most trouble because it's the one used for spinning and wears down more rapidly.

My two partners and I got our name, "The Bruises," because the ice-show act we do left us black and blue until we learned the art of padding and taking falls. But our ice skates still take a real beating. They have

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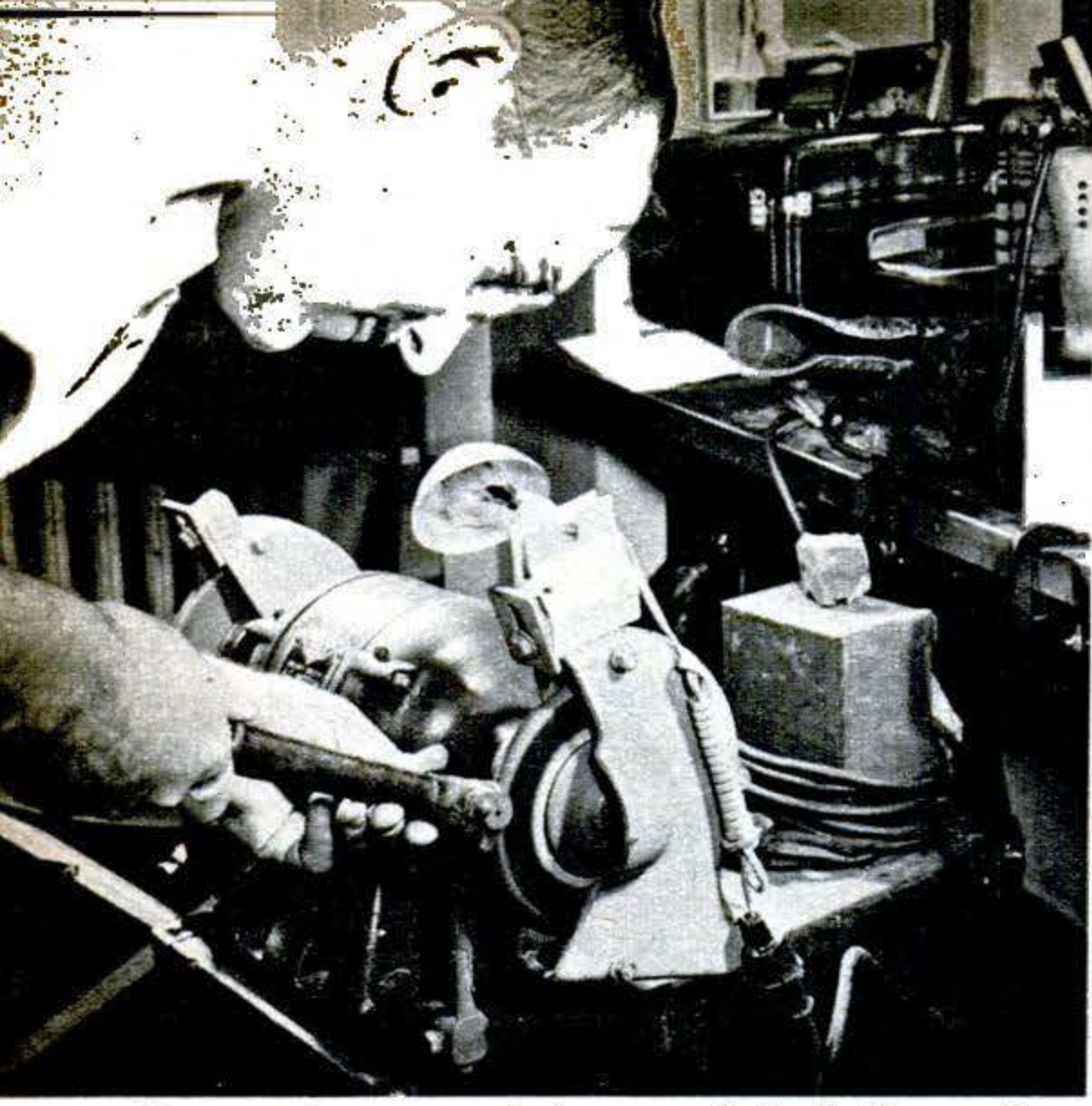
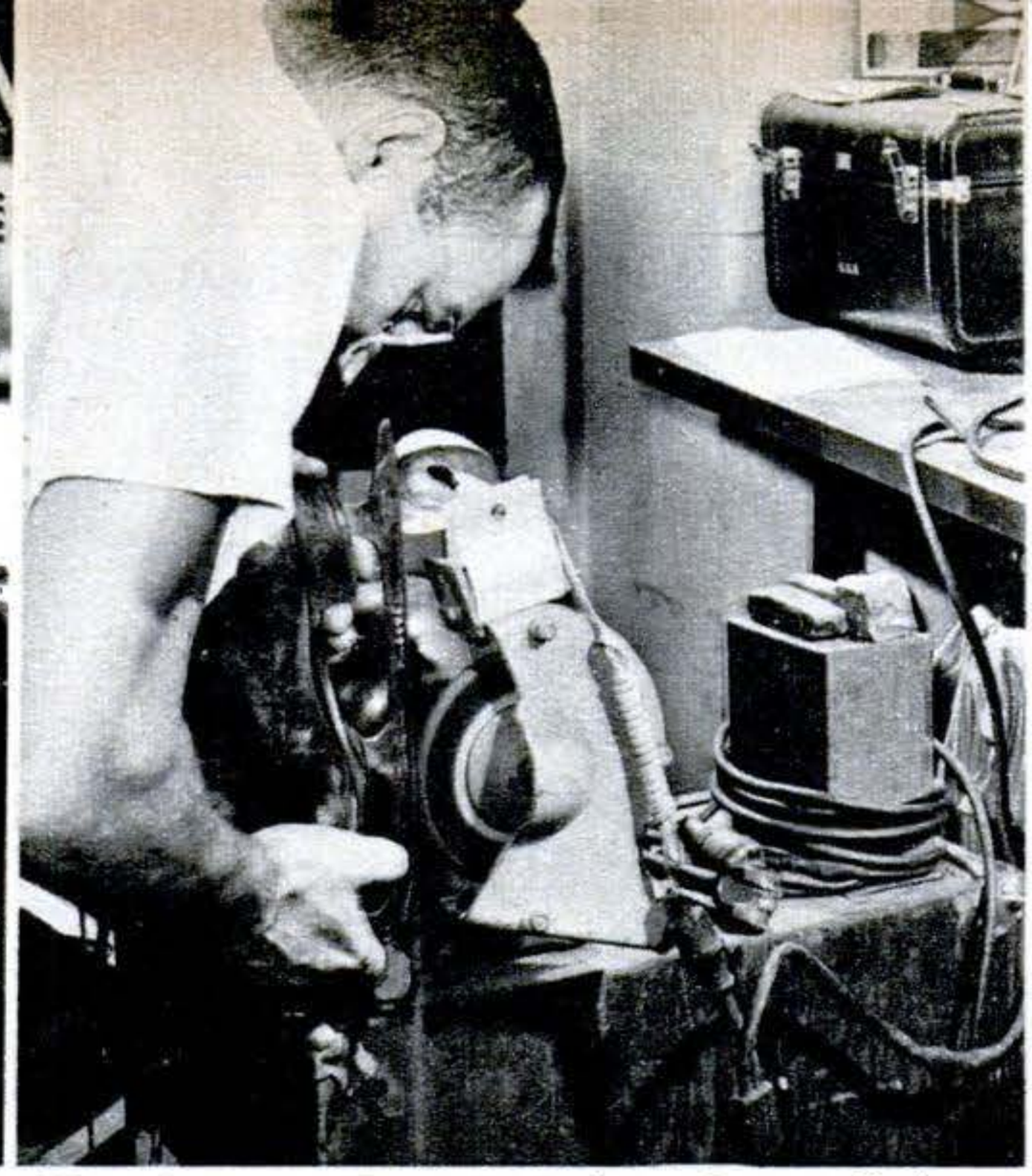
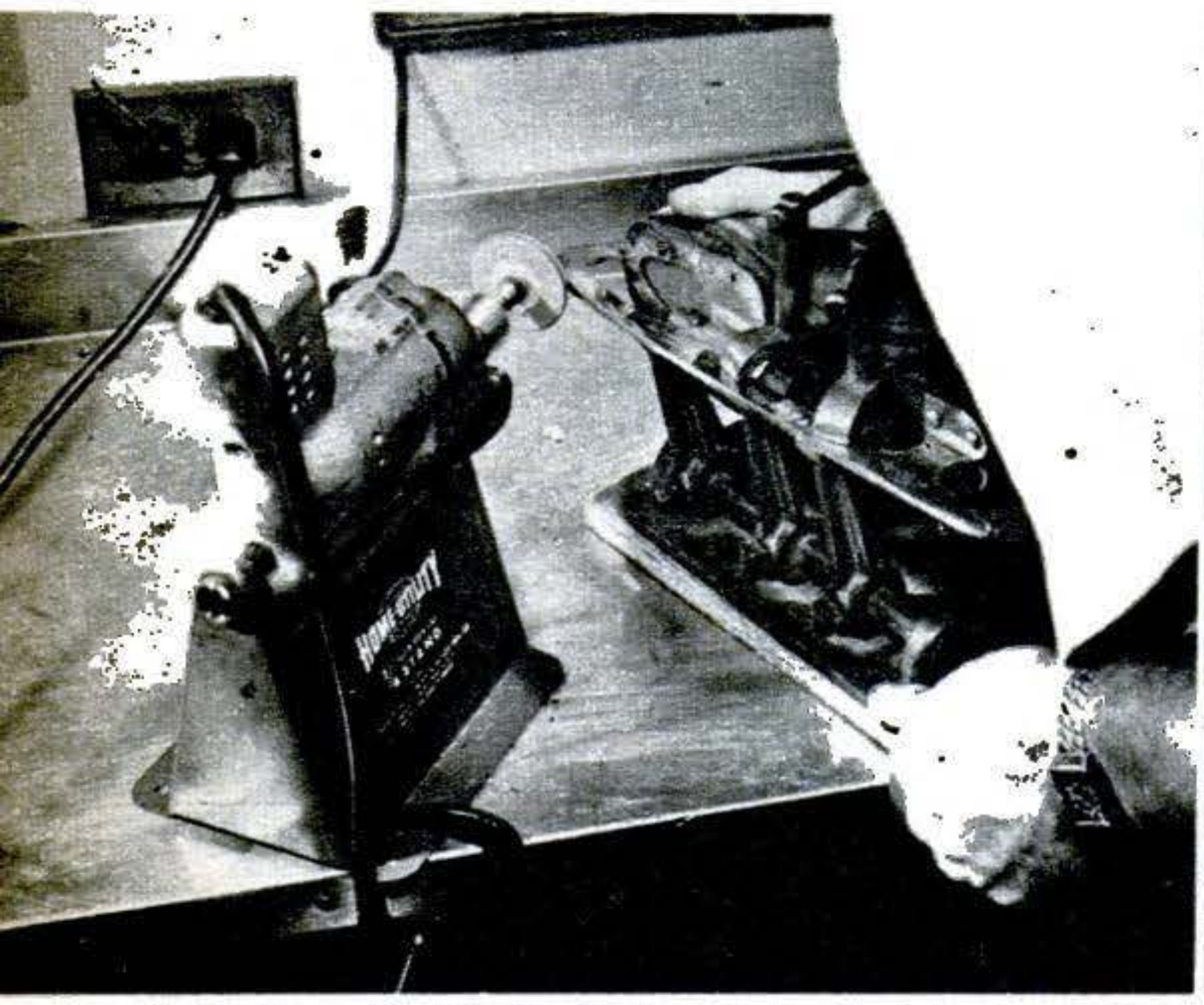


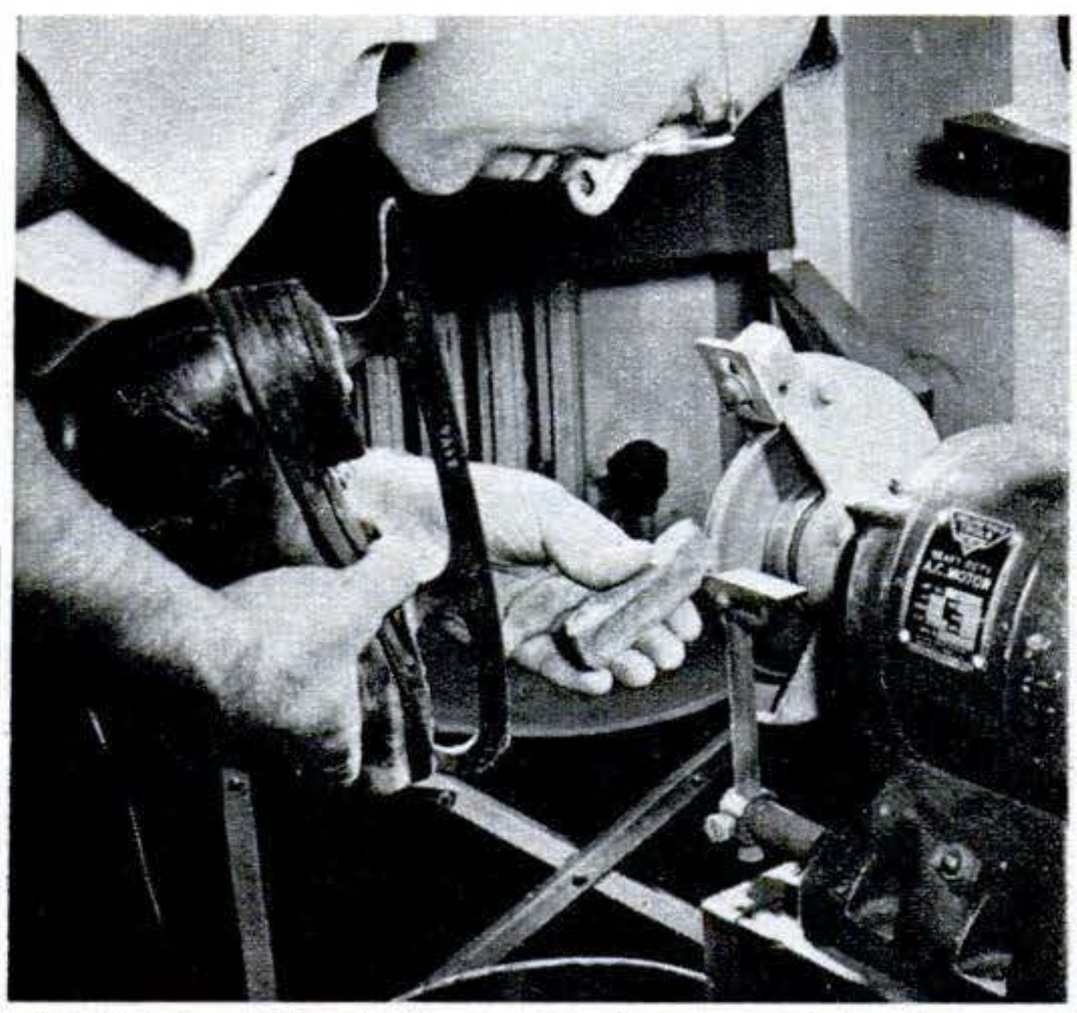
Having determined the size of the hollow to be ground along the bottom edge of a skate blade, Geoffe Stevens uses a dressing tool to shape his Carborundum grinding wheel to proper size.



Here he is grinding the hollow. Stevens believes that he is the only man to do this precision job free hand. Usually a jig is used to hold the skate in position during grinding.



Grinding the blade tip is a delicate job. A special jig holds the skate at just the right angle while a small wheel does the shaping, forming either a diamond point or a flat tip.



Polishing blade is the last step. Here Stevens is applying jeweler's rouge to a rubber and Carborundum wheel. A high polish will add 25 percent to the gliding speed of ice skates.

to be sharpened after every performance, and we're on the ice for only seven minutes. A couple of times a week is okay for the girls in the line.

You wouldn't believe that ice could wear away hard steel the way it does. But our electricians know. Every day they have to clean the microphones that get clogged with filings from our skates pulled in by the magnets. That's why my dressing room looks more like a machine shop, and why my nose is kept so close to the grindstone. END

Tips on Skate Care

1. Wipe all the moisture off blades after skating.
2. Never hang skates over heat to dry.
3. Check screws to make sure that the blades are fixed firmly to the boot.
4. Don't walk on metal or stone.
5. If blade edge won't take a shaving off your fingernail, skates need sharpening.

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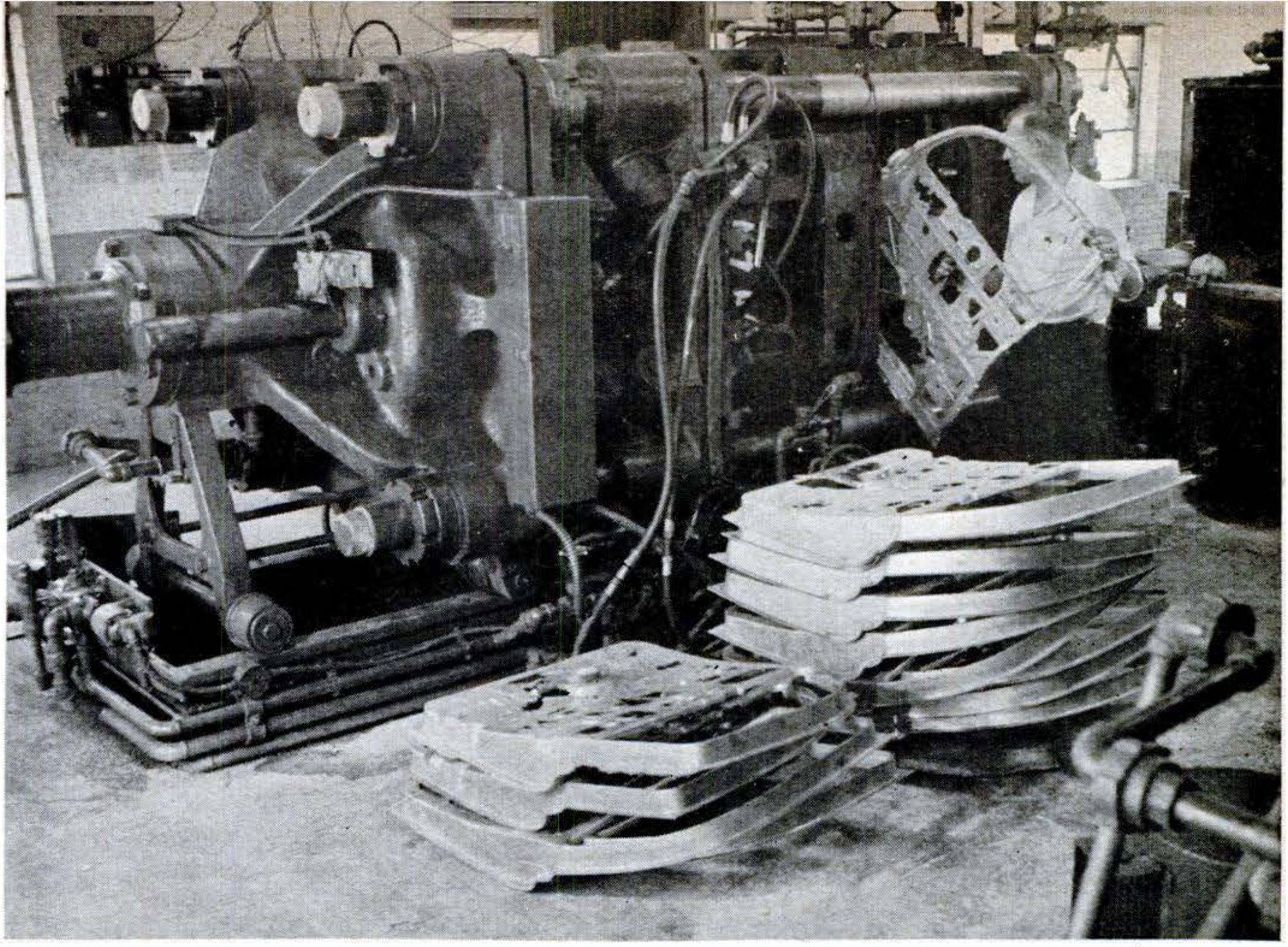

This big die-casting machine turns out experimental aluminum inner frames for Kaiser and Frazer automobile doors. Die set weighs 13 tons. Doors are cheaper, lighter than steel stampings.

Cast Aluminum Cuts Car Weight, Cost

OUT at the Kaiser-Frazer plant at Willow Run, Mich., they're making auto doors a new way—casting the frames in aluminum instead of stamping them out of steel. If the process works out for making other body parts, it may mean lighter, cheaper cars for everybody.

Aim of the experimental method is to eliminate costly multiple-stamping operations. A die-casting machine can turn out more than 30 one-piece frames an hour—and makes unnecessary four steel stampings per door and the huge presses that form, trim, and flange them.

The cast doors permit the use of lighter hinges and pillars with less reinforcement.

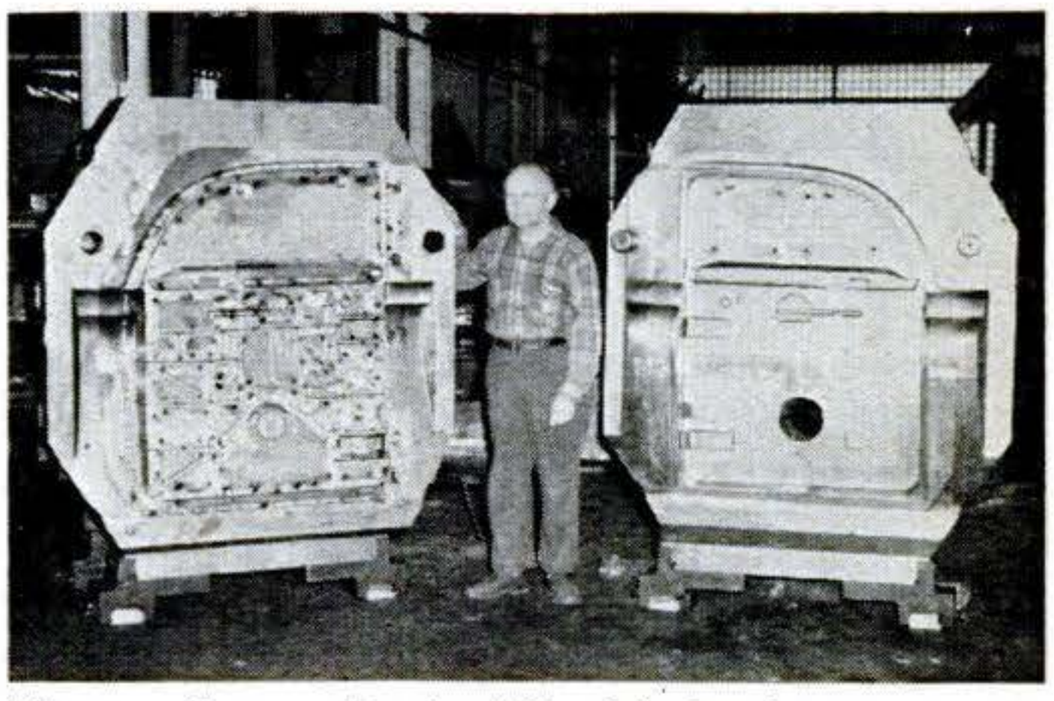

Photo shows die itself with intricate cutouts to accommodate window and locking mechanisms. Company claims cast doors permit better weather sealing, quicker accessibilty for repairs.

Below are three stages in making die-cast car doors: cast-aluminum frame (left); outside of door with sheet-steel panel clamped to frame (center); and inside of completed door (right). Trimmed, casting weighs about 12 pounds, saving about 9 pounds on each door.

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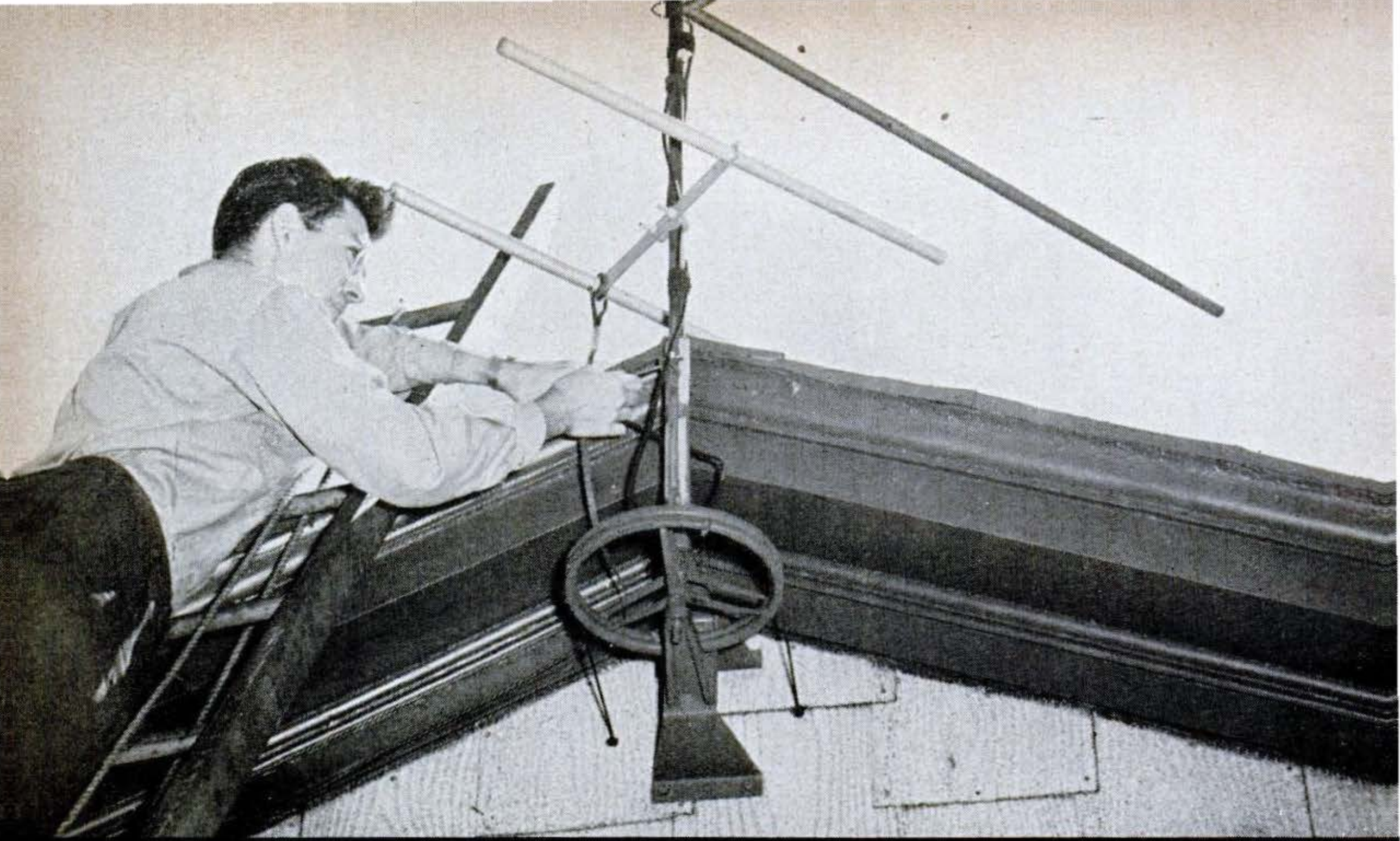
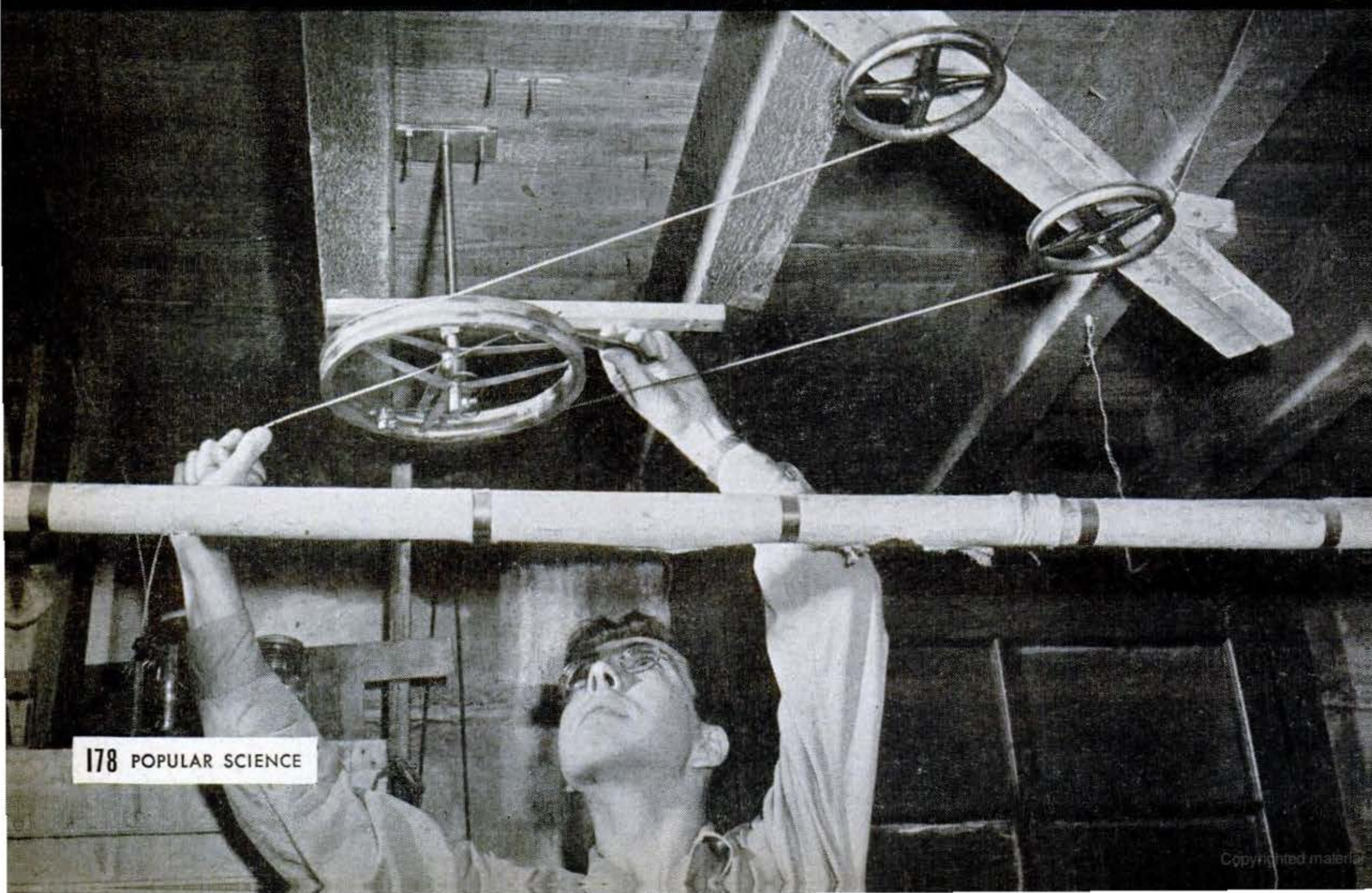


Placing the outside pulley near the roof peak allows the mast to be cut to a short stub.

3 Ways To Rotate TV Antennas

Cables run down to identical pulley in the basement; the shaft goes up through floor.



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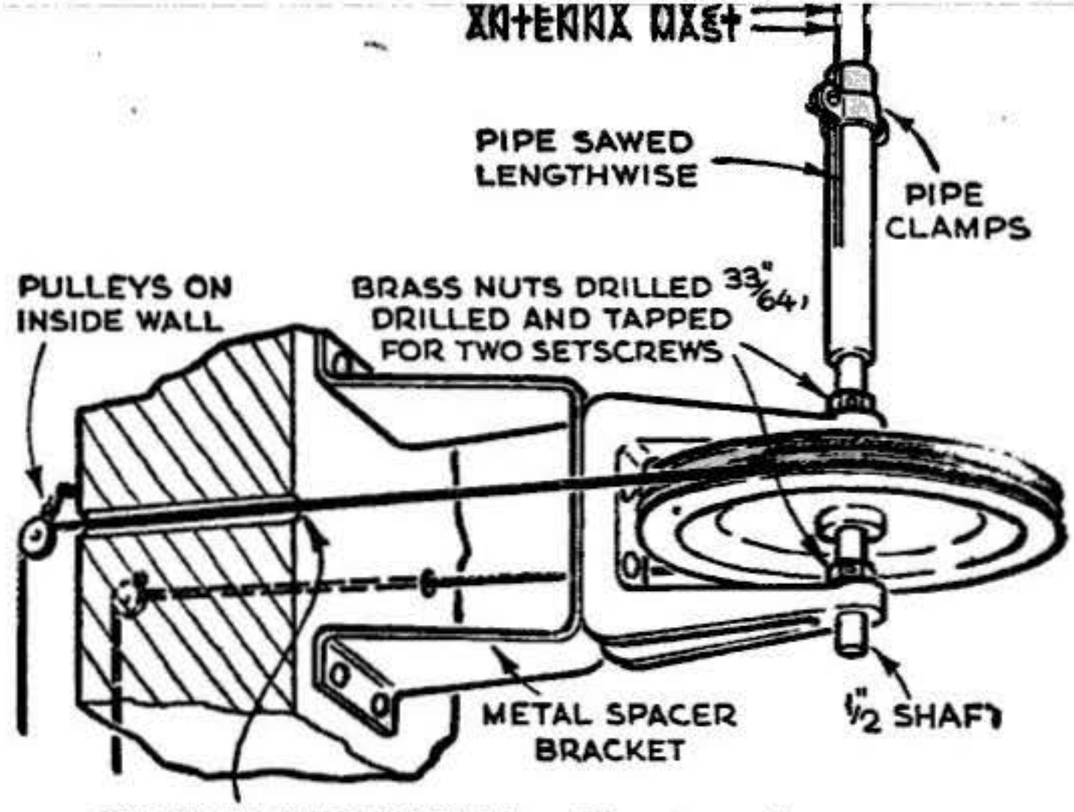
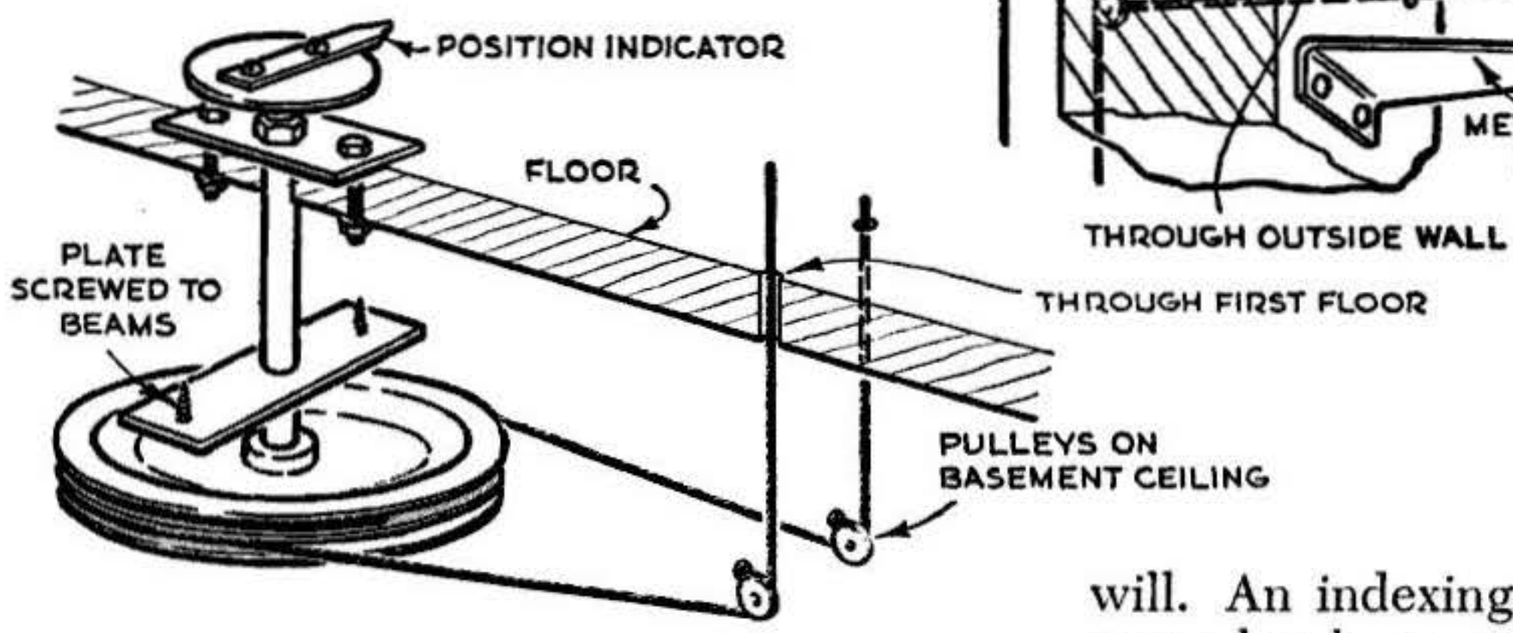
Clever craftsmen improve reception by devising ways to swing dipoles.





Moving the position indicator shifts the roof antenna in any desired direction. Equal pulley diameters give a 1-to-1 ratio of pointer to mast.

By Robert Gorman

IS YOUR television antenna doing the best job it can? An array that does wonders in one location may be all wrong in another.

Why? Because all TV dipoles are directional. They pick up signals best when they are oriented broadside to the transmitter. To catch a weak signal it is often necessary to increase the gain of an antenna, especially when you live on the fringes of a signal area. You can do this by adding reflectors, directors, and other gimmicks, but increasing an antenna's sensitivity automatically narrows its directional pattern. It then becomes more necessary to line up your antenna squarely at right angles to the direction of the station you want to receive.

If there is only one station in your locality, this may not be difficult. But let's assume that there are two or more on one band—for example, channels 2 and 4 at the low-frequency end—and that they come from different directions. You could orient your antenna to a compromise position half-way between them, but this might sacrifice the quality of your reception of either or both stations. Or you could use two or more separate antennas, each one favoring a particular station.

There's a third choice, which is often the easiest and best: to rotate your antenna. By making it movable you can "tune" the antenna every time you switch to a new channel.

In building a rotator, you have to consider three main elements:

- A mounting that will support the mast and permit it to turn.
- A control unit near the receiver that will permit you to move the antenna at will. An indexing arrangement on the control to locate station positions is also desirable.
- A link between the inside control and the antenna outside. This may be either mechanical or electrical.

You will, of course, also want to provide enough slack in the transmission line or lead-in wire to let the array turn freely. A mechanical stop to keep the antenna from turning more than 360° will keep you from twisting the wires off.

Mechanical Rotator

The rig pictured above and on the facing page was built by Edward Zafian, of Bayonne, N. J. His design was largely suggested by available materials and equipment—a drill press, lathe, and a welding outfit—but it can be adapted to your requirements.

The bracket that spaces the pulley out from the house wall, for example, is actually bent up from ⅛" metal, but it could just as readily be made of wood. Similarly, the wheel-bearing assembly is a war-surplus bronze casting with the ends drilled for a ½" shaft. But this, too, could be wood, though metal bushings would then be needed.

Pulley wheels are the double-groove type. The wire in each groove enters a hole in the groove and is secured by a clamp. In similar installations, baby-carriage wheels could be made to serve nicely. The wheel can be brazed to the shaft, or the hub can be drilled and tapped for setscrews. Brass nuts or collars are used as bearings on the two arms of the supporting fork. All parts of the roof-top rig should be rustproof.

Stainless-steel cable is attached to the pulley wheel, looped around 180°, and

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brought into the building. Tight rubber fittings help weatherproof the entrance holes on the outside.

Inside the building the cables are turned downward over two pulleys. In this installation the wires are brought into the basement, across the ceiling, and then up to the floor of a closet near the receiver, where the control handle and indexing pointer are located. The pulley wheel in the basement is the same size as that on the roof.

Phono-Motor Control

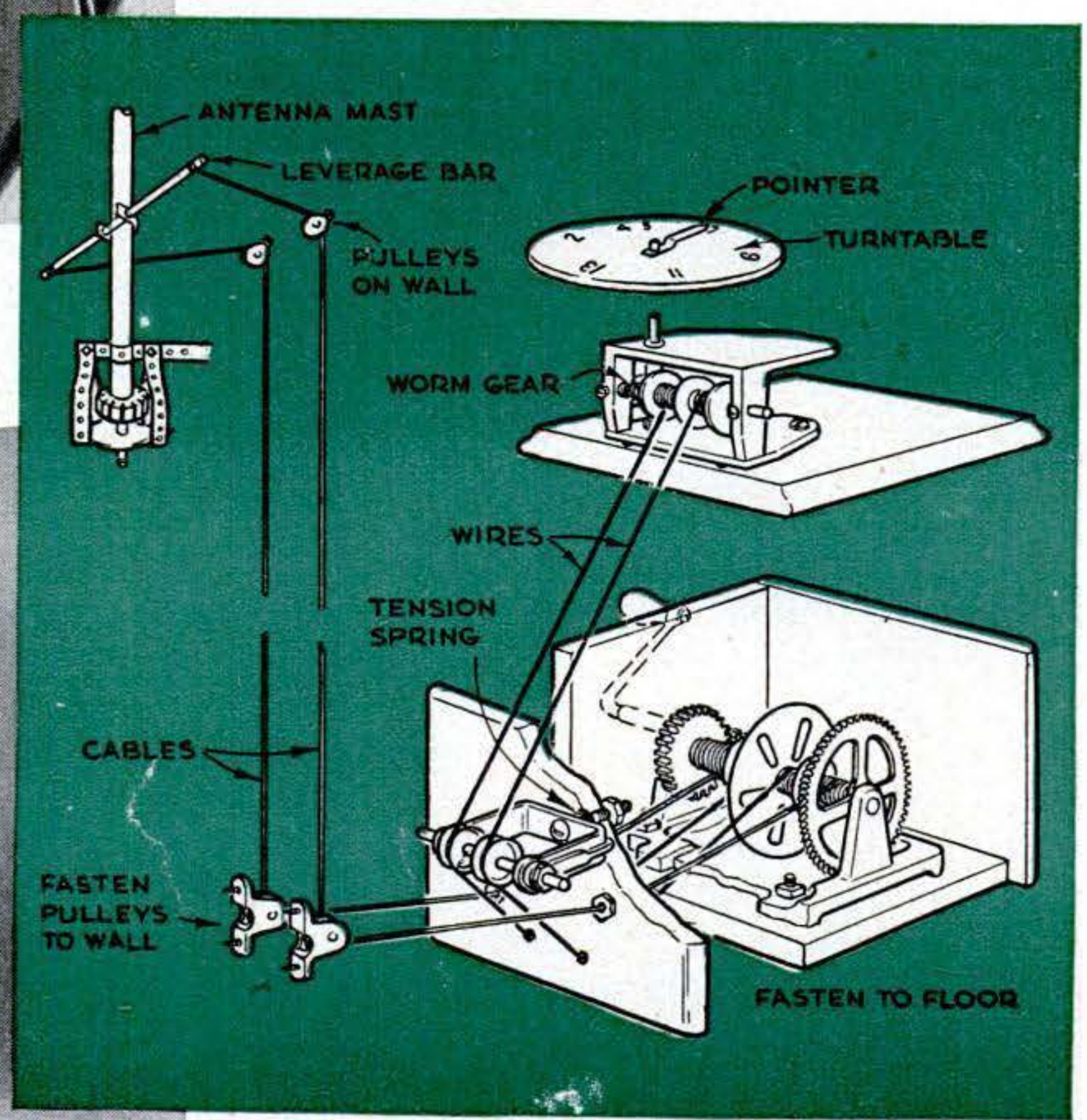
An odd assortment of junk-yard salvage is used in the second rig, shown at the left and below. Fred Henkel, of Hollis, N. Y., built it. He used an old spring-wound phono motor and part of a Model-A Ford generator.

The springs of the phono motor were removed and the wind-up shaft used to drive four cables. The cables operate in pairs, one pair reeling in as the other reels out.

As you can see in the drawing, one wire from each pair goes outward, through pulleys, to the leverage bar clamped to the antenna. The other two cables are brought to a shaft and worm gear that drive a pointer on the turntable. Channels are marked off on the turntable for quick and easy selection.

The end plate and bearing of a Model-A generator are used as a pivot for the antenna mast. The bearing plate supports the bottom

Adding a rotator required very few changes in the installation above. The control unit, made from a spring phono motor, is pictured below.



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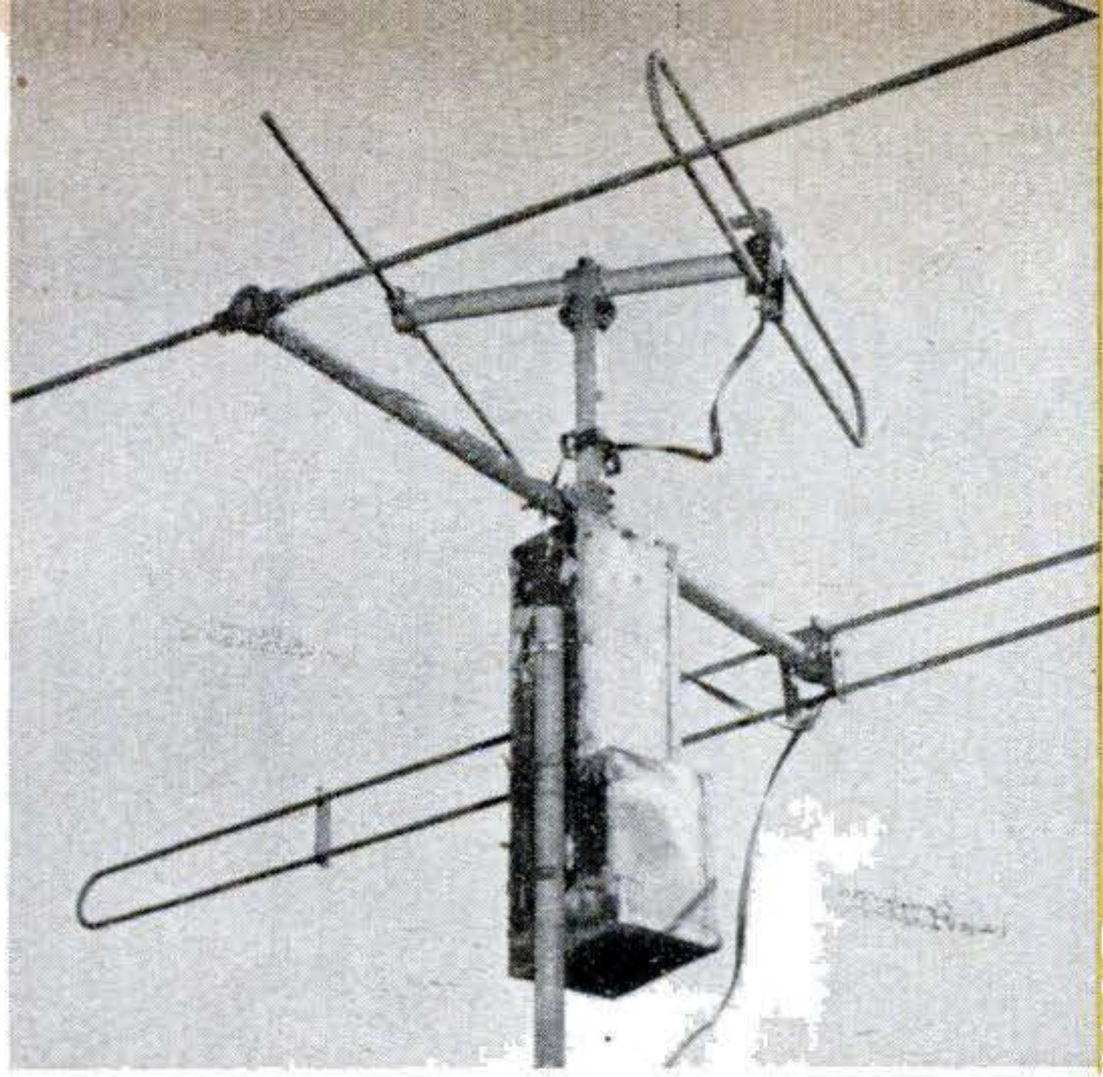
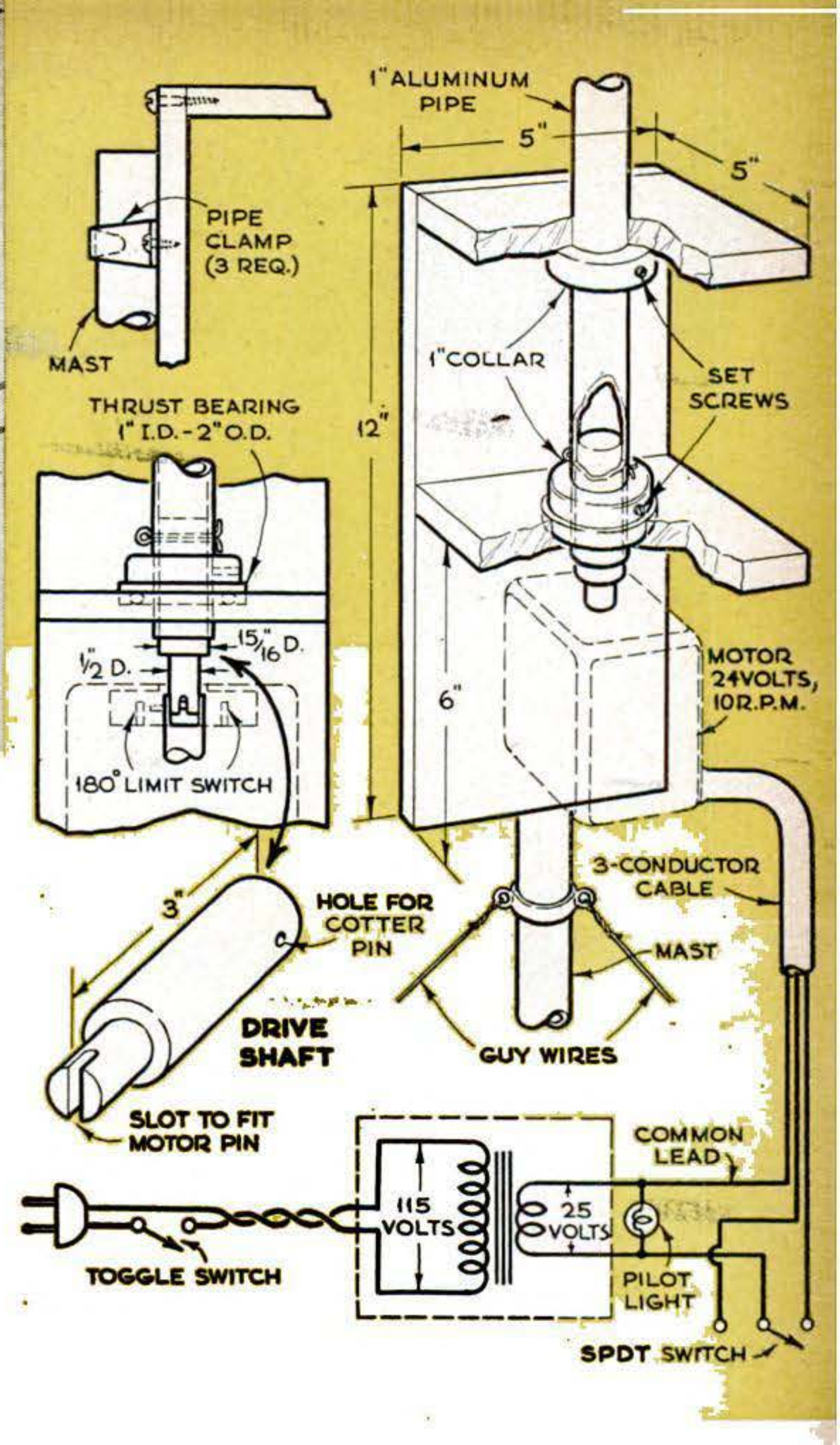


Motor-driven antenna is governed by a switch located at the receiver. A three-wire cable brings power to the roof; the rest of the mechanism is sealed inside a weathertight box.



end of the armature shaft, while the mast is slipped over the top end and rests on the core.

A housing for the shaft is bent from steel straps and bolted to one of the supporting arms of the antenna. Bolt clamps on the mast itself are loosened a turn or two—just enough to allow rotation without permitting sway or side movement.

Motorized Antenna

The electrified system, above, is the work of George Basler, Hoboken, N. J. He has a surplus 24-volt motor arranged so that he can turn his antenna simply by throwing a switch at the receiver. Aside from the switch and transformer, the entire mechanism is on the mast.

The motor is mounted on a 5″ by 12″ piece of weatherproof composition board and attached by screws from the back. In this case the motor housing had tapped holes for the screws; lacking them, a metal strap might be used to secure the motor.

Two 5″ by 5″ squares of the same composition board are drilled to line up with the motor shaft, and one is counterbored for a standard thrust bearing. The drive shaft can be turned from steel or bronze. One end is a tight fit inside a piece of 1″ aluminum pipe, while the slotted end fits over the drive pin on the motor shaft. The collar resting on the thrust bearing is positioned to take the weight of the antenna off the motor.

Both high- and low-band antennas are fastened to the aluminum pipe and the back board of the assembly is held on a supporting mast by pipe clamps.

Electrical controls, consisting of an on-off switch, an SPDT reversing switch, a pilot light, and a 25-volt transformer, are incorporated in a box. Outdoor parts are boxed in with sheet copper for protection against the weather.

A standard 115-volt motor could be substituted for the one shown. It would have to be a 1 or 2 r.p.m. type and would probably require the addition of limit switches. These switches were built into the aircraft motor that was used. END

Earth Radiates Heat into Space

IN ADDITION to receiving heat rays from the Sun, the Earth is continually radiating heat into space. Otherwise it would get too hot to support life. About June 21, in the northern hemisphere, the amount of heat received during the day is considerably greater than that which it radiates away during the same day and night. The Earth keeps getting warmer until July, when the heat lost begins to exceed that gained in the same period. Then the Earth starts to cool. The reverse effect occurs in winter.

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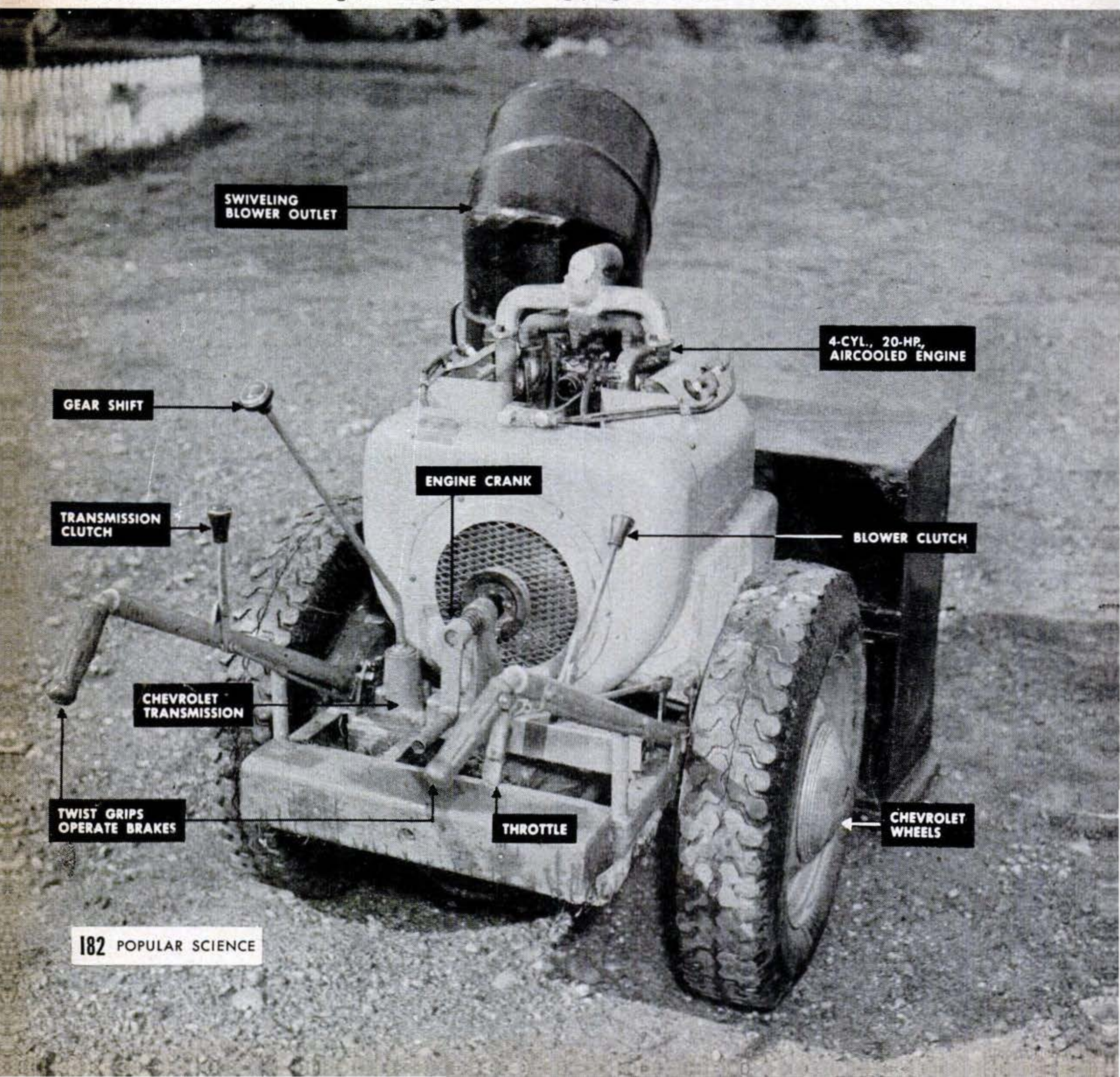
How I Blow Snow Away

In action, my homemade plow blows path 42 in. wide through snow up to 36 in. deep. It throws snow 40 ft. Chains improve traction.

By Paul Walker, Jr.

PS photos by Hubert Luckett

Convenient controls make the plow easy to operate. A disk clutch lets me disengage blower at will while another clutch permits shifting the transmission into desired gear. Engine has a governor, but I prefer to hand-feed the gas because there are times when it must be shut off quickly. The 900-lb. plow is steered by applying brake to inside wheel on a turn.



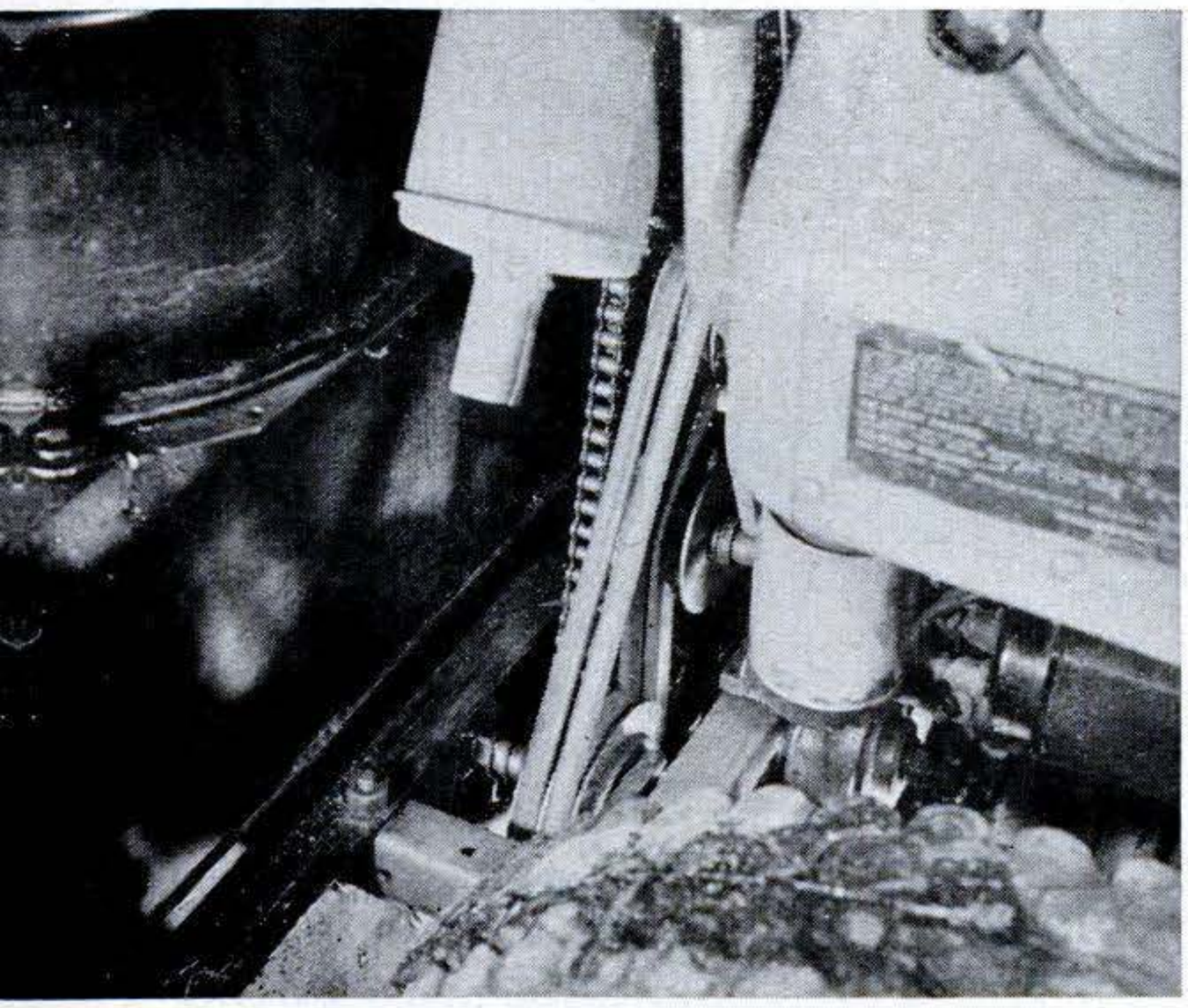
BLOWING snow off sidewalks and driveways beats shoveling it any day. It's easy—now that I have my rotary snowplow.

In building it, I cut down an old Chevrolet rear end so the wheel distance, center to center, was 32 in. I also reversed the unit to bring the drive into the differential from the rear. Then I mounted a 20-hp. Wisconsin engine on a channel-iron frame.

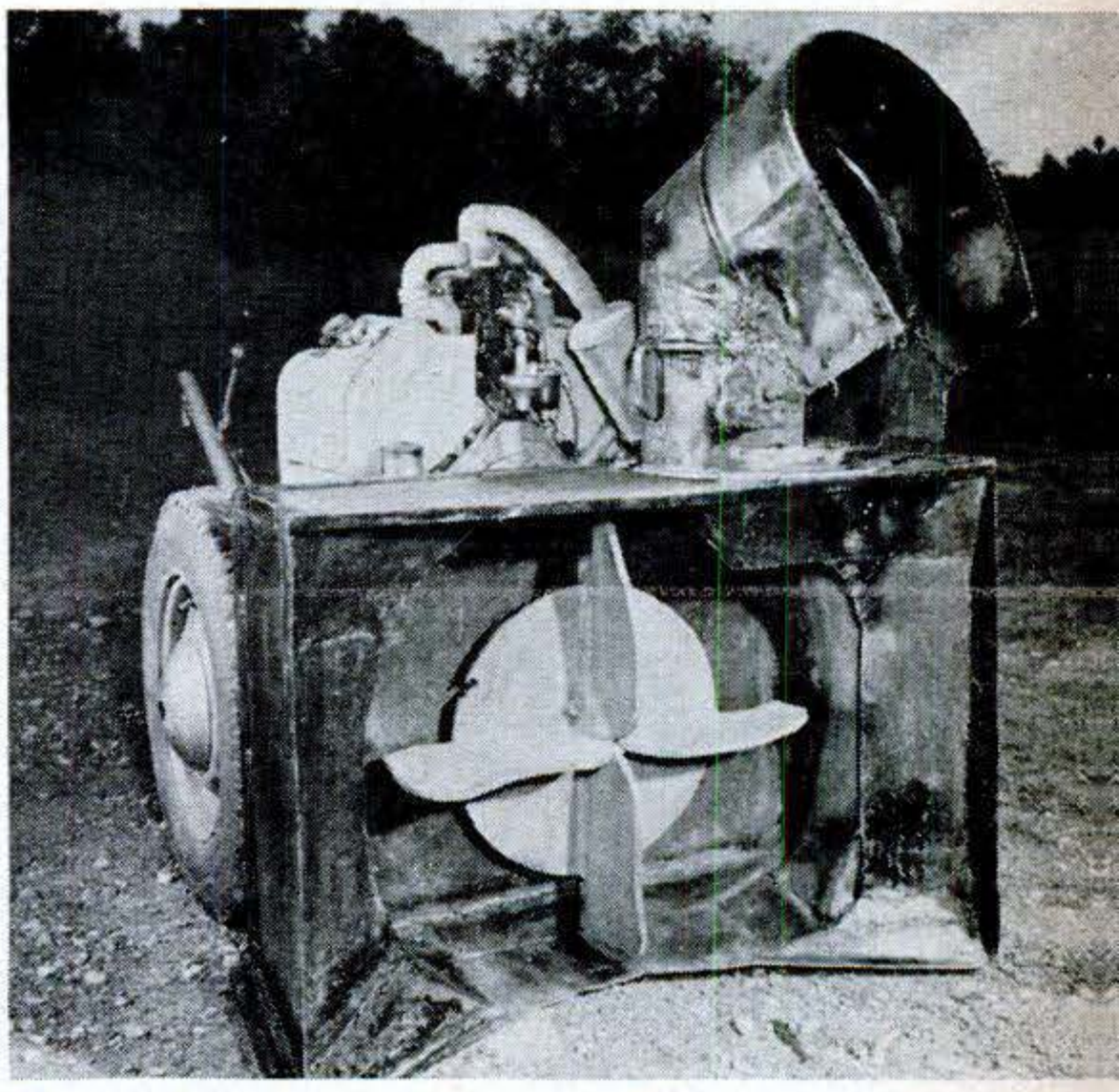
A ⅝" roller chain drives the blower, the sprockets giving a four-to-one reduction from engine speed. When necessary, a dry-disk clutch on the fan shaft allows me to disconnect the blower. To propel the plow, two ⅝" V belts operate a pulley and dog clutch on a shaft running back to the transmission. There's a two-to-one reduction at this point. From the transmission, power goes to the axle, with a five-to-one reduction, by sprockets and a roller chain. Low seems to be the best plowing speed—about 2 or 3 m.p.h. Engine speed must be kept at about 2,400 r.p.m. to throw snow well.

The brakes are applied individually. Turning the twist grip operates a rod inside the hollow handle and a linkage at the lower end. Handles were made of pipe.

Later, I expect to adapt the unit for use as a garden tractor. For that reason, the blower was made detachable. END

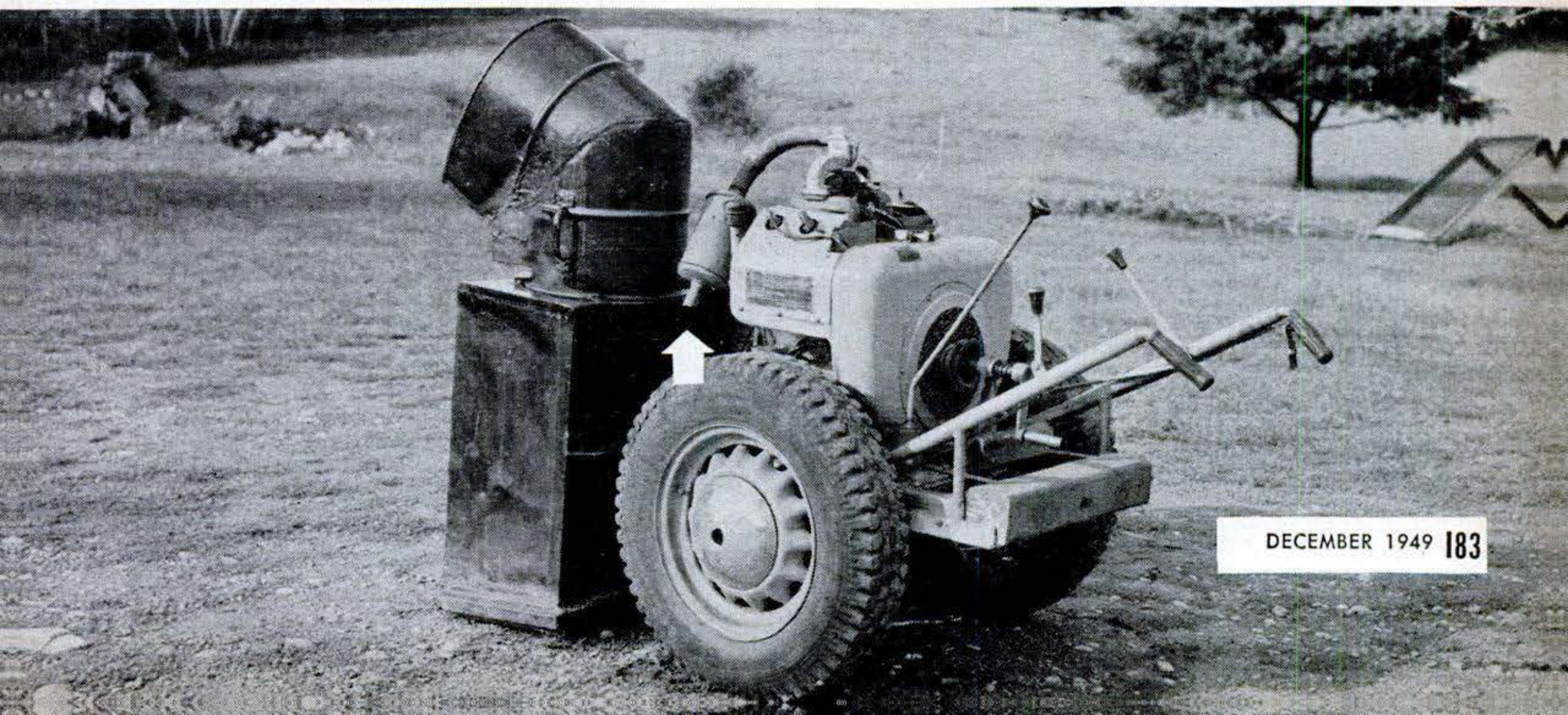


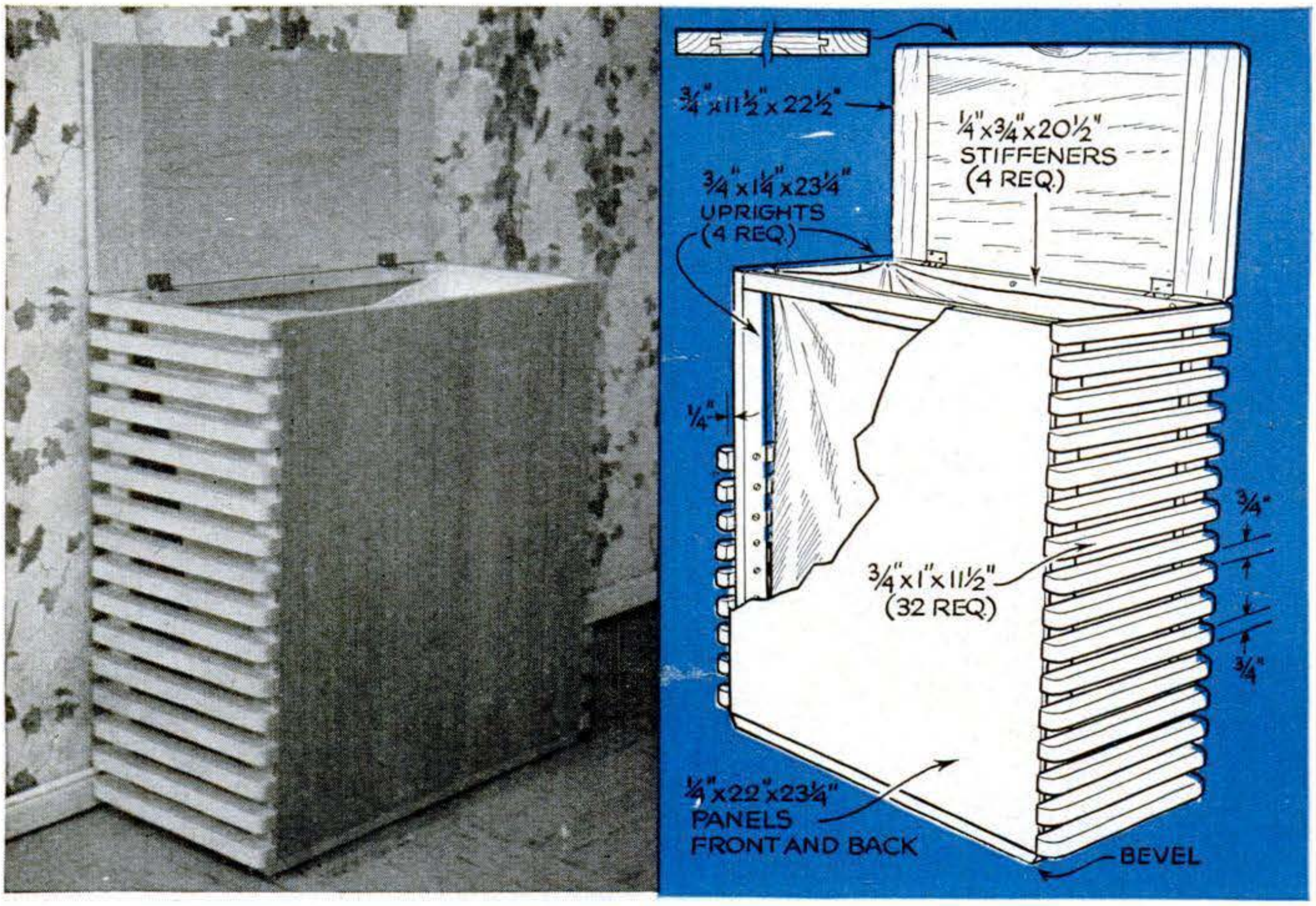
Power take-off at front of engine (arrow below) drives blower and propels plow. Roller chain turns blower, and the two V belts turn shaft running back to the Chevrolet transmission.



Blower housing is 30" high, 42" wide, and 18" deep, welded from 1/16" sheet steel reinforced with ⅛" angle iron. The 24" blower, cut and welded from ½" plate, has a 2"-diameter shaft.

The snow outlet turns in any direction except to rear. This lets me shoot snow with the wind.





Need a Clothes Hamper?

Make one like this out of plywood and strips.

THE handy man can make his own modern-looking clothes hamper in an evening or two. Here's a design for a sturdy, sanitary, and well-ventilated laundry container that will suit almost any home.

Several sub-assemblies make up the hamper; they can be ripped in jig time on a power saw. If you're doing the job by hand, buy strips as close as possible to the given sizes and modify the plans accordingly.

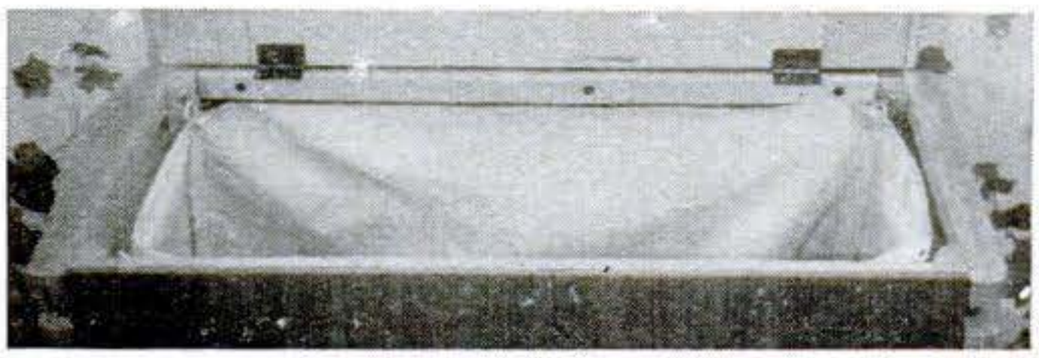
Each ladder-like end requires two uprights and 16 crosspieces. The outer ends of the crosspieces are rounded and the pieces screwed to the uprights so that the ends project ¼" front and back. The inner edges of the uprights must be sanded snagproof.

Front and back panels are the same size, but not necessarily of the same material. In this case, ¼" combed or striated (pronounced "stry-ate-ed") plywood was used for the front because this type of striped surface makes the large flat area interesting without making it conspicuous. The cheapest kind of plywood was used for the back. Both panels are braced top and bottom by ¼" by ¾" by 20½" stiffeners.

Top and bottom are also the same size, but the lid needs a finger notch. You can use ¾" plywood or solid stock. If you select the latter, it is advisable to build up the full-size lid with two endpieces having grain at 90° to the center panel so as to resist warping. Use glued tongue-and-groove joints.

Glue and nail the front and back panels to the frame and set and cover the nails. Sand all parts and apply desired finish.

Install cup hooks at the top of the corners inside to hang the removable liner on. Plastic or metal rings can be stitched to the corners of the bag for reinforcement.—*George R. Jones, San Diego, Calif.*



Hooks at the corners hold the removable liner bag. Ask your wife to stitch one up to size.

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Here's the finished plywood furniture. Building it was described on pages 98-109. Of the many ways of finishing the pieces, four methods that you'll find easy to use are given here.

Do It Up Brown or Blond

By Denis Sneigr

Here are four ways to give your plywood furniture smart, lasting finishes.

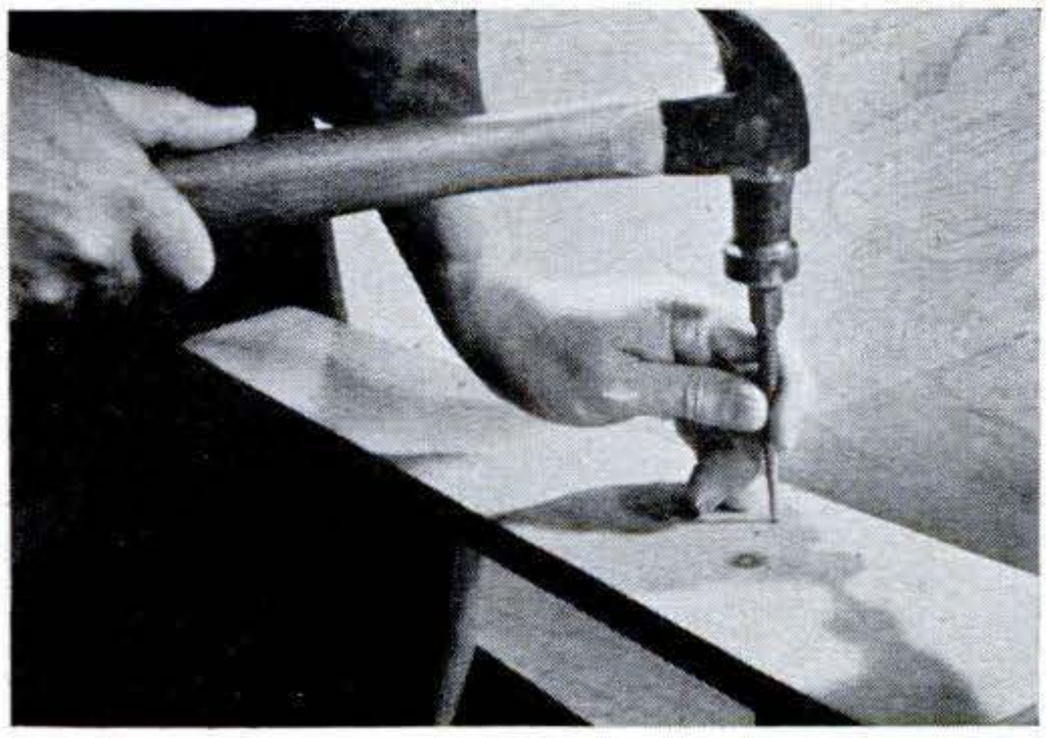
THE FINISH is only the beginning—the beginning of your enjoyment of the modern furniture you saw built on pages 98-109.

Although there are a number of different ways you can finish your fir-plywood furniture, we're going to describe only four here. All have these big points in their favor: they're attractive and they're easy to apply. They are: paint or enamel, natural, blond, and stain.

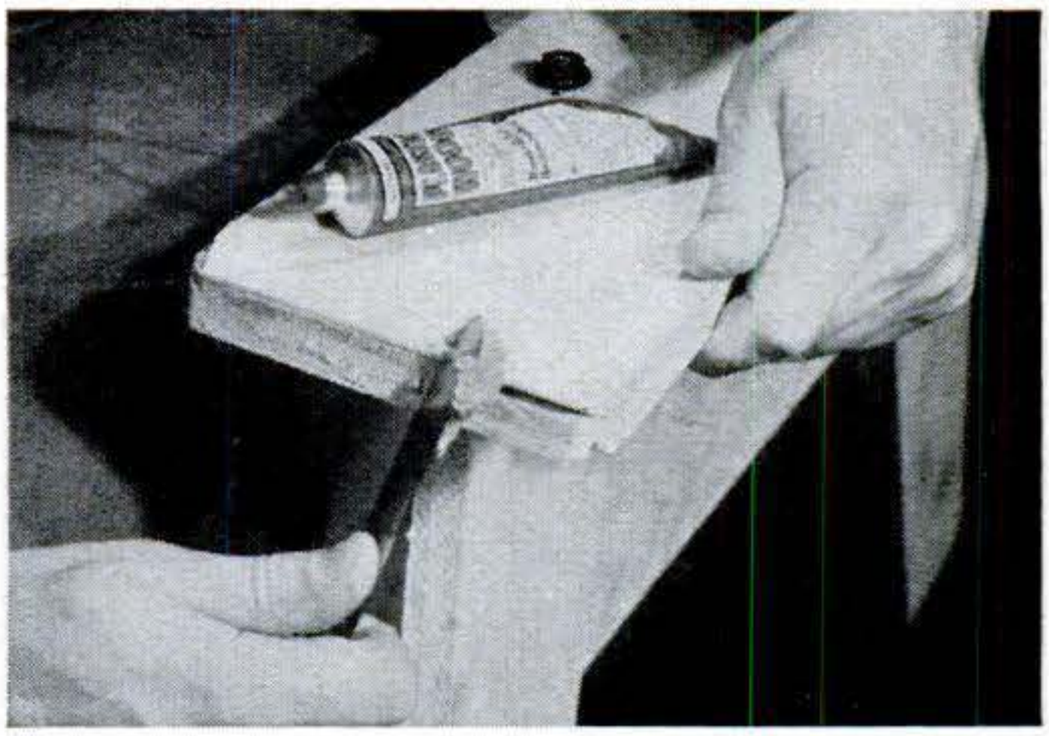
Of course, if you build with one of the more expensive hardwoods, there are several other finishes you can use. But we'll talk about the fir first. It's the most widely used plywood and the least expensive.

It used to be tough to get a decent finish on fir because of the wild grain. The stuff would face-check—that's the proper term for those hundreds of tiny cracks that you've probably seen on painted surfaces. They don't show up when you first finish the work. They come later. Then, if you have used a stain instead of a paint, the wild grain will cause too much contrast in the grain.

But you can lick both those problems by using a penetrating sealer such as Firzite®. The maker doesn't claim that Firzite will positively tame the wild grain in every case. Some fir is so wild that it'll face-check anyway. But Firzite does the job in the majority of cases. And even if the wood does check, the result won't be nearly as bad as if the sealer hadn't been used.



Use nail set and hammer to sink all nail heads below surface of the wood. Punch heads in ⅛" to 3/16". Follow this with composition wood, filling in over all sunken nail heads.



It's easy to apply the putty with a spatula or knife. Latter is used here. Plywood edges sometimes develop cracks where a piece of ply has chipped out. Fill these spaces, too.

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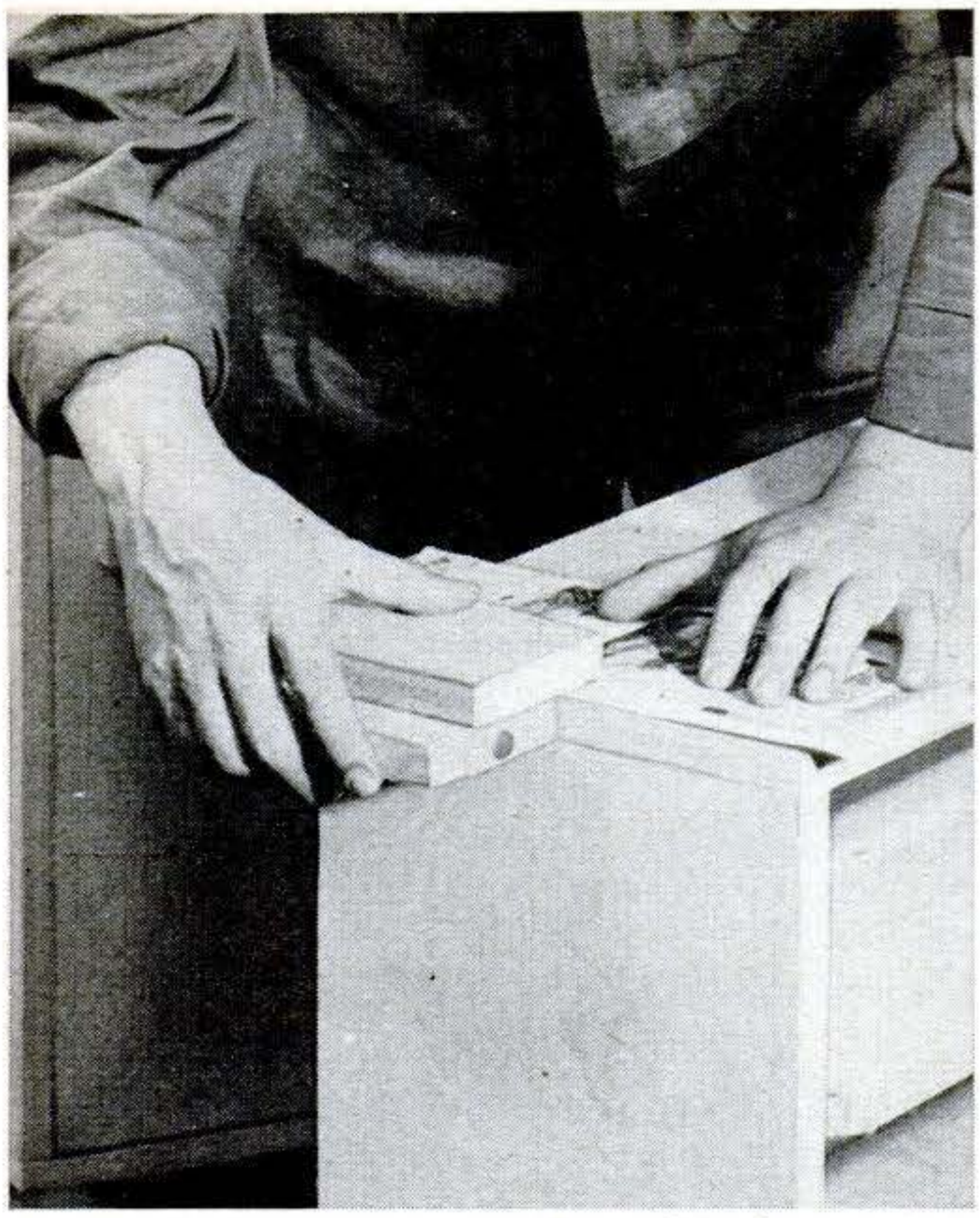
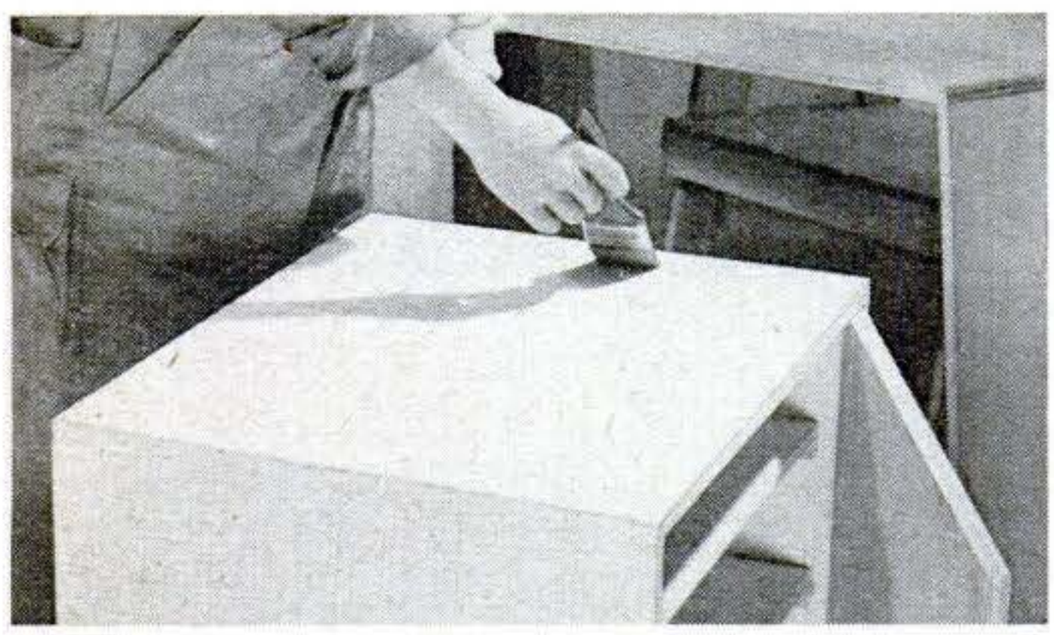


Sand edges this way. Nail two blocks together with lower block the same thickness as edge to be sanded. Tack sandpaper to lower block and protect top of furniture with sheet of paper.

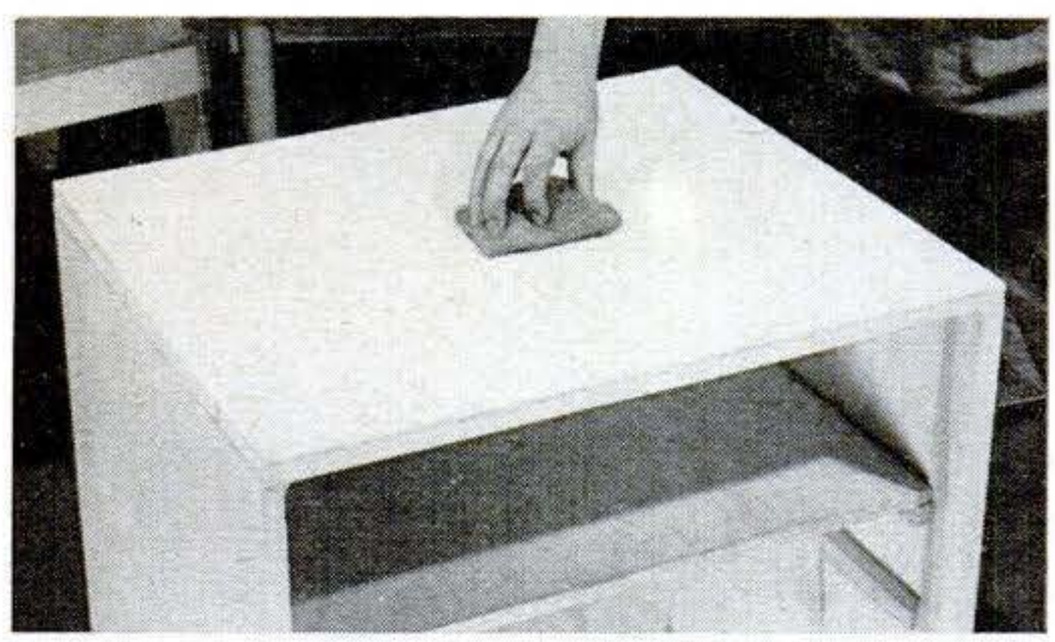
Fir grain acts up, if not treated, because it has two growths a year—spring and summer. The spring growth is soft; the summer harder. Moisture swells the soft growth and dryness shrinks it. Then you have a difference in the heights of the two growths. That's wild grain. Firzite hardens the softer growth to about the density of the other.

Preliminary Work. First thing to do after completing your furniture is to set all nail heads. Fill in over them with plastic composition wood and then sand all surfaces thoroughly. Plywood is sanded at the mill, but by the time it reaches you some fuzz will have been raised on it. So rub it down with fine sandpaper. This job may get tiresome, especially when you're anxious to get on with the final finishing. But a good sanding job will pay off.

Painting. You can get any color scheme you want with this method. It's the one we used on the tops and sides of the cabinets, the bed ends, and the table legs. Cover all surfaces to be painted with White Firzite. It not only seals the wood but acts as an undercoat. Let that coat dry. Then rub it down



Fir plywood must be sealed before painting. In above photo, White Firzite is being brushed on top of a cabinet. This seals wood and also serves as an undercoat for paint or enamel.



Let the undercoat dry thoroughly. Then smooth all surfaces lightly with 00 steel wool or 00 sandpaper. Don't take off too much undercoat; just get a smooth surface for painting.

After sanding undercoat, wipe off all dust and apply paint or enamel. These cabinets were given two-tone finish. Doors were left natural. Sides, top, and backs were painted black.

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lightly with 00 steel wool. Dust the furniture, and you're ready to put on paint.

The other three finishes are intended to let the grain pattern show. You can get a natural finish with a clear brushing lacquer. Or you can use stain plus wax for a desired tone. And you can get the modern blond effect by applying tinted White Firzite and wiping it off.

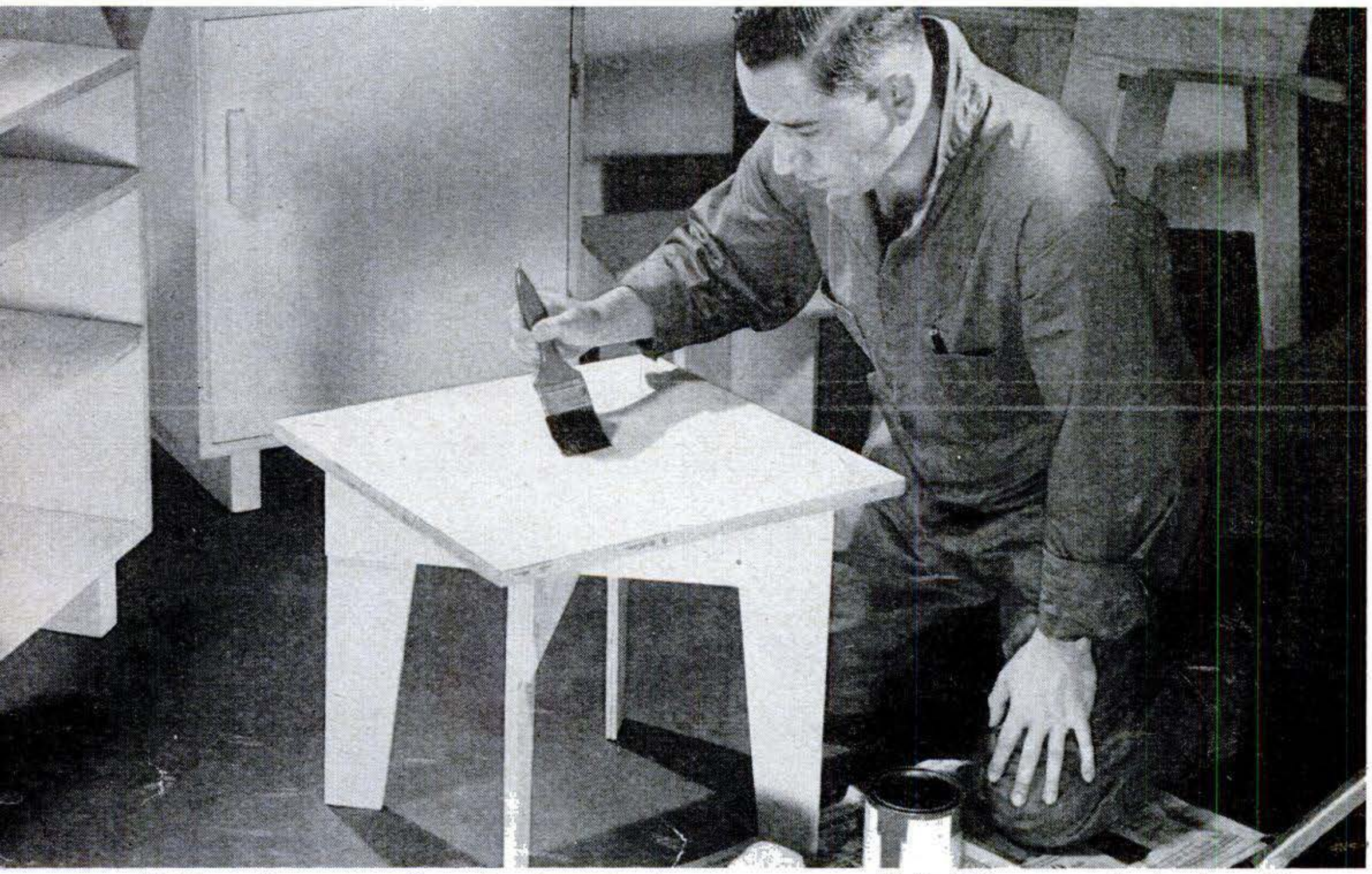
Natural. Brush on a coat of Clear Firzite and let it dry. Rub it down with 00 steel wool. Then put on two or three coats of clear brushing lacquer, such as Satinlac®, letting each coat dry thoroughly and using steel wool between coats. Brushing lacquer should be flowed on plentifully. Go over the surface only once. Don't brush back and forth as you do with paint or enamel. It dries fast, too, so only work a small area at a time. Use steel wool and finish with a paste wax. This finish was given to the cabinet doors, chairs, and table tops.

Stain. Use Clear Firzite. Let it dry, then rub with steel wool. Apply the stain and wipe it off. When dry, brush on a coat of white shellac. Wax finishes the job. One easy method is to use Minwax®—stain plus wax. You can buy it in several different shades to suit your color scheme. Wipe the stain on with a cloth or brush it on. After it has set about 15 minutes, wipe it off. Test on a piece of scrap to get the depth of shade you want. Repeat with a second coat 24 hours later. When it's dry, apply hard wax.

Blond Effect. Use mineral spirits or turpentine to thin White Firzite about 10 to 20 percent. Mix in a little color-in-oil. You can buy this in different colors. Take it easy here. Mix the color slowly and try it on scrap until you get the shade you want.

Brush on a coat of the tinted Firzite. Leave it on two to four minutes and wipe it off. You might try this on scrap, too. Then you'll know how long to leave it on. Let it dry for 24 hours. Sand lightly with 00 paper. Put on clear brushing lacquer. When dry, rub with 00 steel wool. Apply a second coat of lacquer. Use the steel wool again. Finish with wax.

Should you build with one of the more expensive hardwoods, the chances are you won't want to paint it. You'll want the



Tables also were given two-tone treatment. Legs were painted same black as cabinets. Tops and edges of tops were given a natural finish. After wood was sanded, a coat of Clear Firzite was applied. When completely dry, this was rubbed with 00 steel wool. Then two coats of clear brushing lacquer were put on. First coat was smoothed with steel wool.

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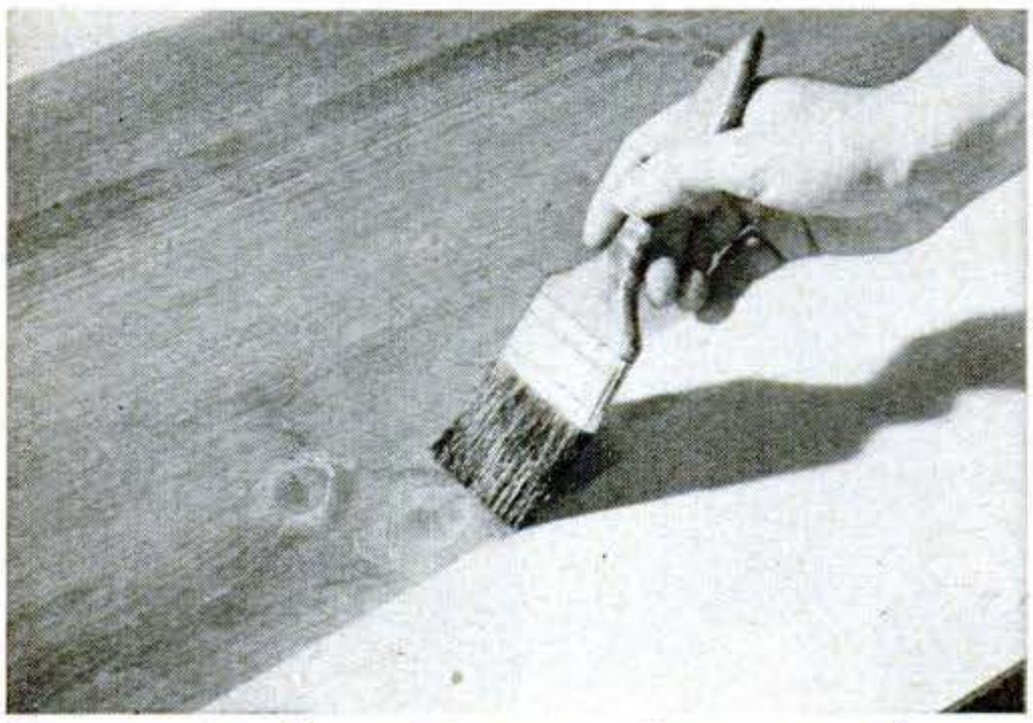
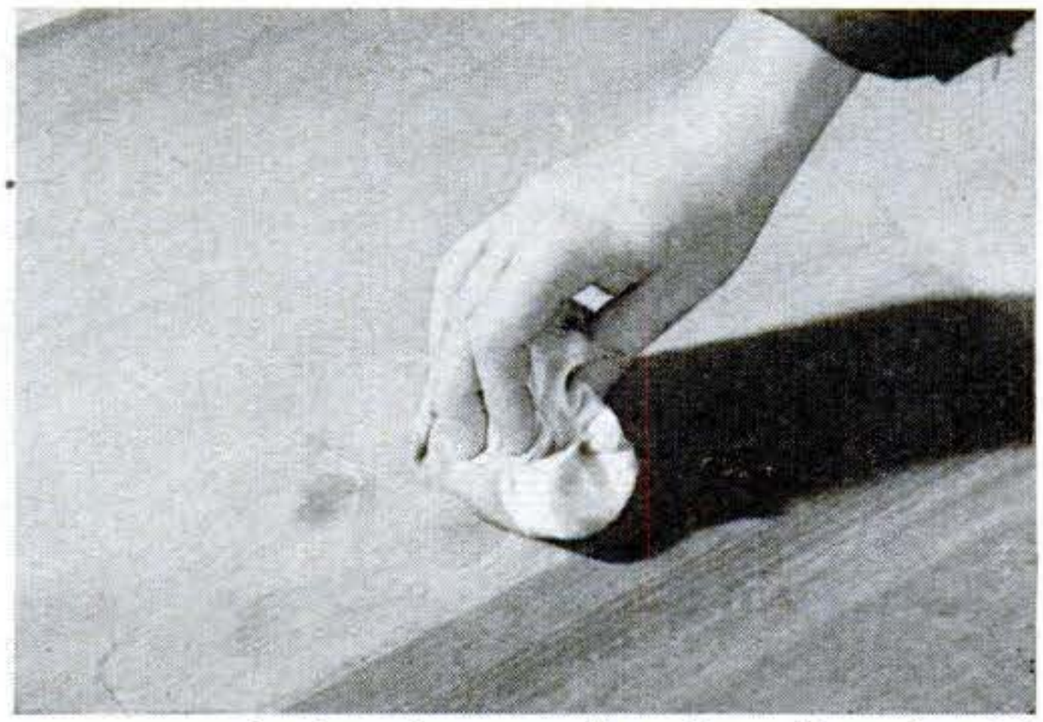
Chairs also were finished natural. Like table tops, wood was sealed and given two coats of clear brushing lacquer. Only visible parts were treated. The underside of seat wasn't touched.

handsome grain figure to show. You can give birch plywood the blond effect the same way it's applied to fir. Mahogany, walnut, or oak takes a nice light-natural finish. Use two coats of brushing lacquer and wax, using steel wool between coats. You can also get a pickled effect on the oak by giving it the blond finish.

Before you start dressing up your furniture, here are a few hints that'll come in handy. Don't scrimp on the sanding if you want a really good finish. Don't do sanding in the vicinity of newly painted pieces. They'll pick up dust. Don't buy cheap brushes. They'll drop bristles all over your work. Don't buy top-price brushes. Get the medium-priced ones.

And clean your brushes thoroughly. The lacquer brushes must be cleaned in lacquer thinner. Turpentine will do for the paint brushes. Don't use the same brush for paint and lacquer. Keep them separate. And finally, remember that two or three thin coats of paint are better than one thick one. END





Simple finish is Minwax. First step of two-part operation is shown above. The Minwax stain is brushed on (left). After setting about 15 minutes, it is wiped off (right). Company recommends that this coat be allowed to dry 24 hours. Then apply second coat. After this coat has been wiped off and let dry for another 24 hours, apply the wax—and elbow grease.

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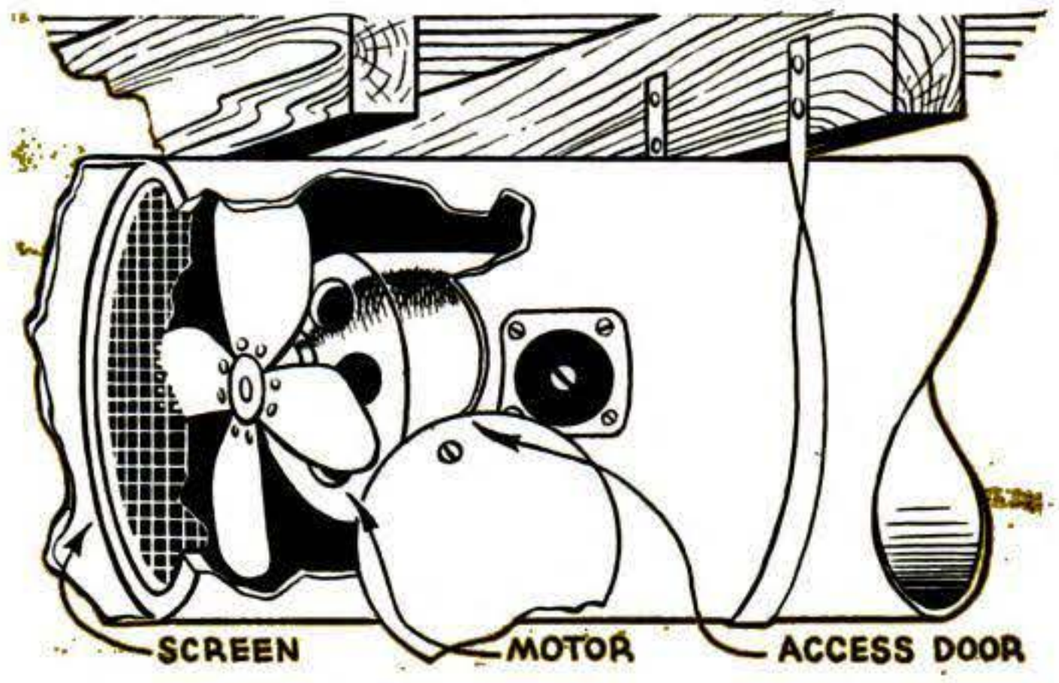
Fan in Heater Duct Sucks Cold Air from Cold Room

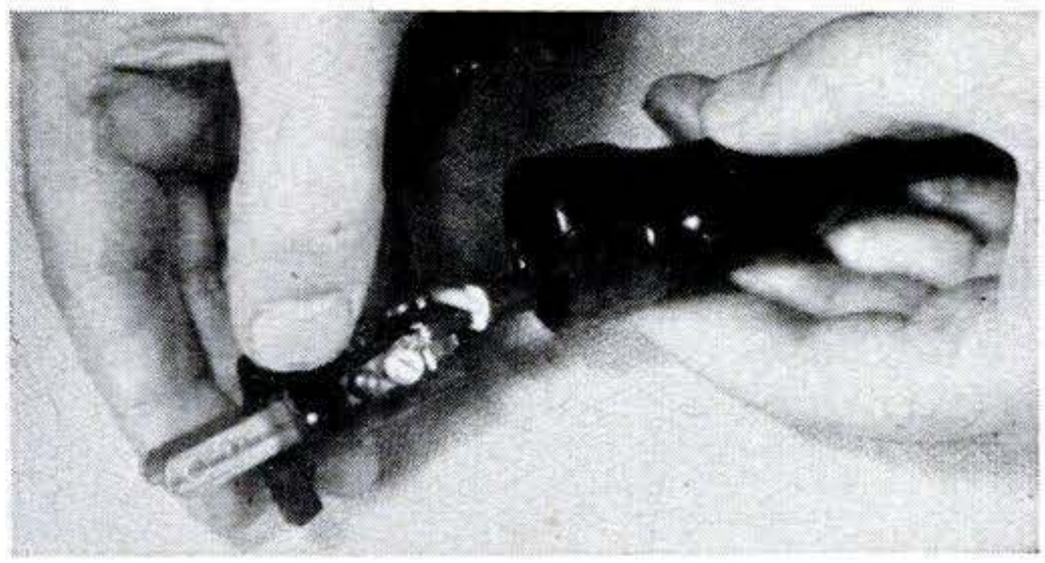
Do you have a room that stays like your refrigerator all winter? We did—and until we installed a fan in the cold-air return pipe, the room was practically useless.

Many homes heated by warm air have a room like that. Ours was a built-on cubicle with no basement, three walls to the weather, and a perfectly horizontal hot-air duct.

We began by pointing up the foundations to shut off outside cold air. Next we smoothed the earth under the floor to help furnace-room air circulate in the shallow space. Then we put a sucker fan inside the cold-air return duct to establish positive circulation.

The 1/15-hp. fan was installed on rubber mounts to reduce noise. An automatic furnace control turns it on when needed. There's a cutout switch in the room.—*R. M. Ormes, Colorado Springs, Colo.*





Plug Has a Circuit Breaker

Here's an electrical plug that automatically cuts the juice when an overload or short occurs. It does the trick with a built-in circuit breaker, and affords better protection to appliances than branch fuses.

The breaker contains a bimetallic element that is part of the circuit. When too much current is drawn, the element heats up, separating two contact points. The unit can be quickly reset.

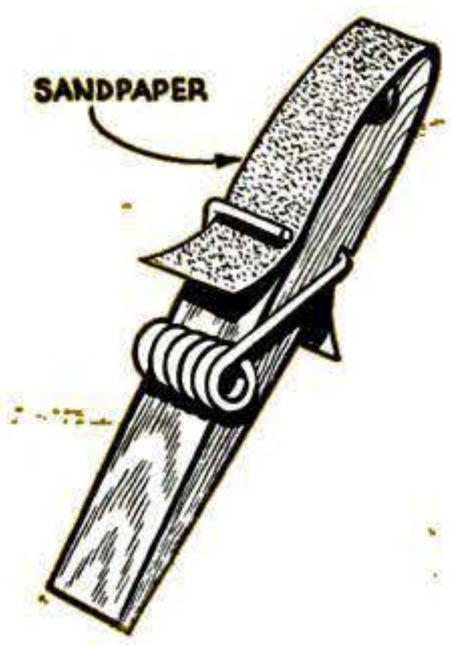
Hopax Electric, Inc., of New York City, makes it in ratings up to 10 amperes.

Pipe Cleaner Letters Signs

For lettering small, simple signs or price cards, a pipe cleaner will do a satisfactory job if you can't find a paint brush small enough. Bend over about a third of the length of the cleaner for a handle.—*Hi Sibley, Nuevo, Calif.*

Clothespin Holds Sandpaper

Take half of a spring clothespin, slip a strip of sandpaper under each end of the spring, and you have a good sanding stick for model making. The sandpaper can be moved along as it wears out at the end. It is also easy to put in different grades.



Crutch Tip Protects Chisel

By fitting a rubber crutch tip over the end of a wooden chisel handle, you can greatly lengthen the life of the handle. The rubber doesn't interfere with your work and keeps the wood from becoming mushroomed.—*W. B. Eagan, Louisville, Ky.*

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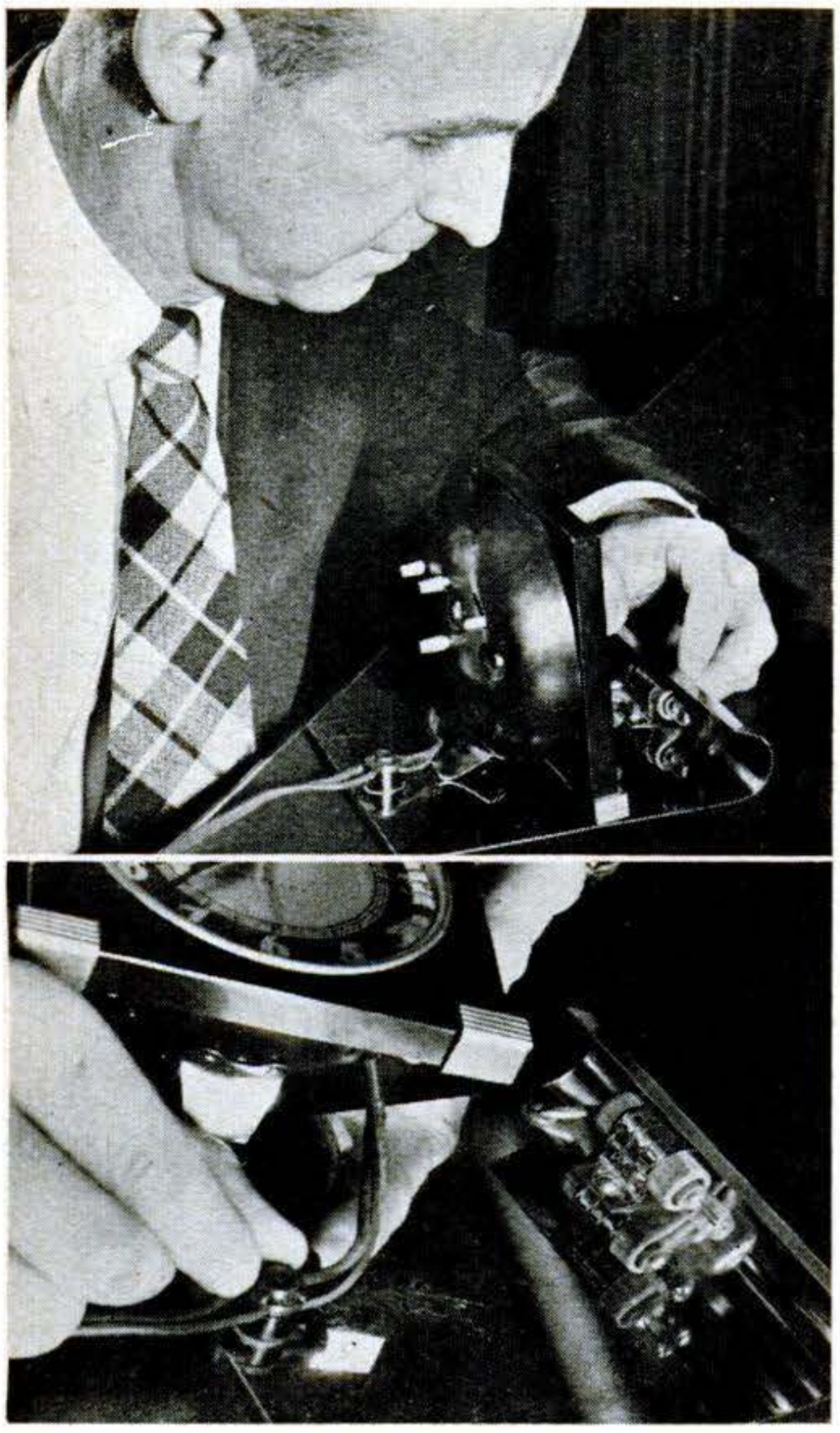
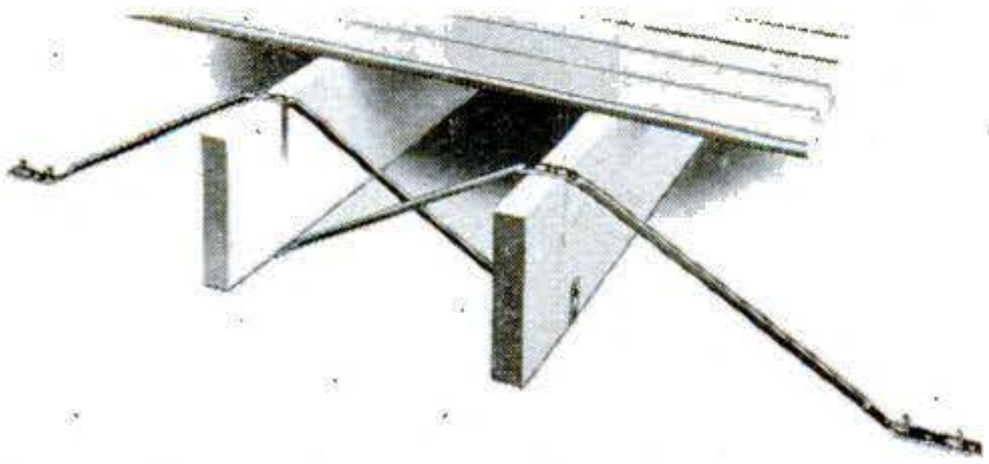


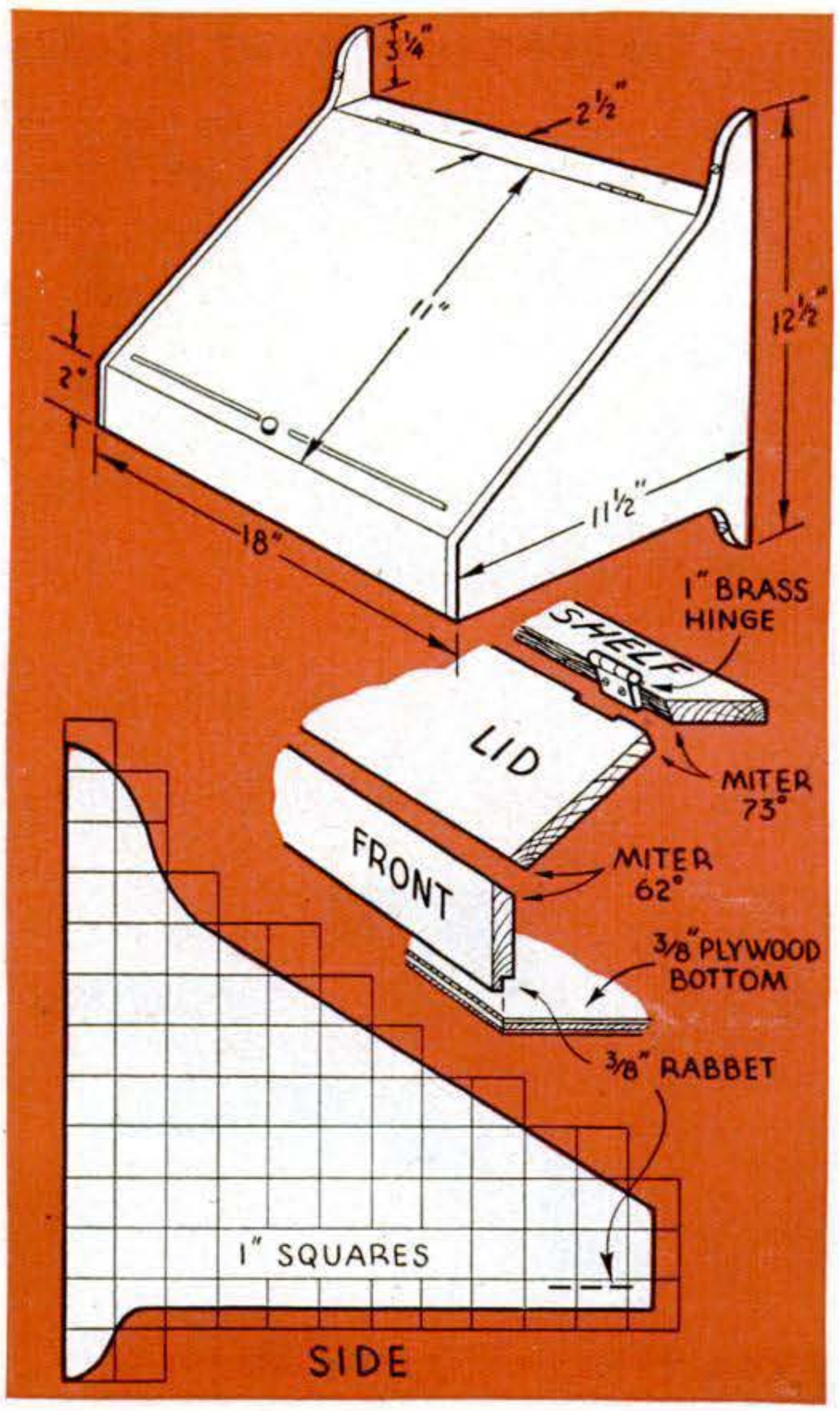
Tiny Bulb Lights Clock

If your bedside electric clock lacks radium hands, you might copy E. W. Beggs, a Westinghouse engineer. He bought a 1/25-watt neon bulb, wired it in parallel with the clock, and mounted it in the upturned curve of a sheet-metal base. The lamp uses only a few cents of juice a year.

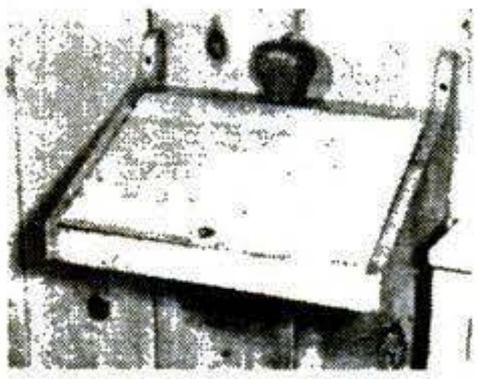


Steel Reinforces Joists

Ready to use without cutting, Tru-Tye® steel bridging comes in one size for wood joists of any standard depth installed on 16″ centers. Only two nails are required for each bridge. Strength of the bridge in tension is 2,000 lb., according to the manufacturer, Dravo Corporation, of Pittsburgh.



Small Desk Fits on Wall



There are no legs to get in the way when you are sweeping around this neat, tidy wall desk. In addition to the storage space it offers inside, its sloping lid serves as a handy writing area, and a small shelf across the top holds your ink bottle, pen, and pencil.

Construction details are shown above. It's recommended that the 18″ width be shortened to 16″ if you mount the desk on a plaster wall. Then the installation screws can be anchored into the studding. The desk pictured was built of pine. Finishing nails were used and the heads set and covered with wood crack filler. The 1″ brass butt hinges may be mortised or not. After sanding, two coats of orange shellac and two coats of paste wax finished the desk. The surface was lightly sanded between the shellac coats. Wax was applied with 00 steel wool. Screws hold the desk to the wall. —*Norbert Engels, South Bend, Ind.*

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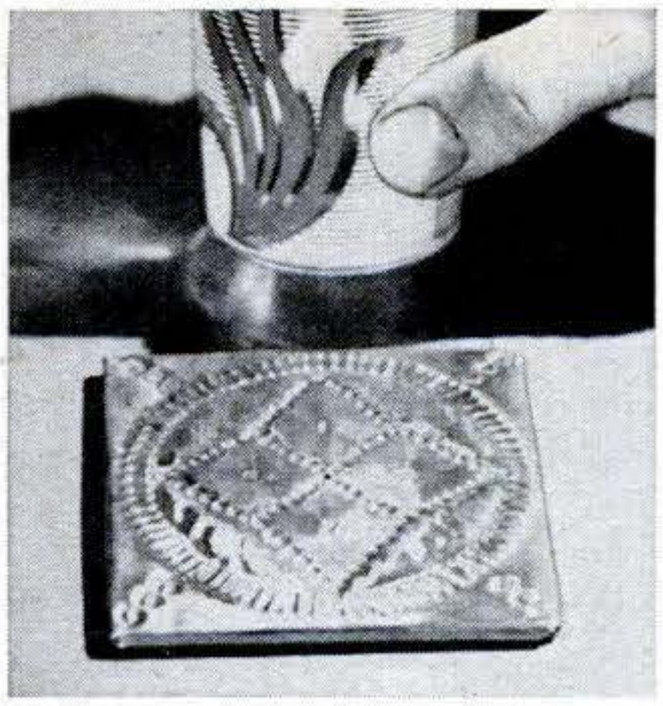
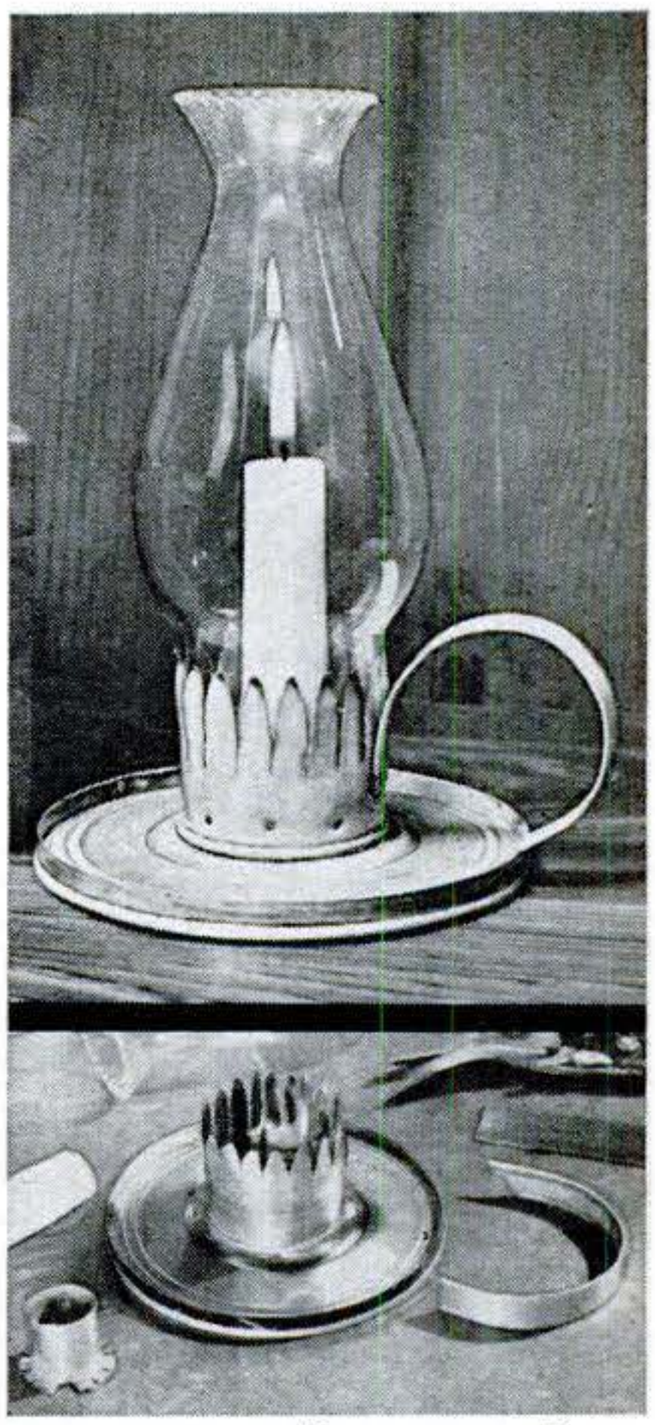
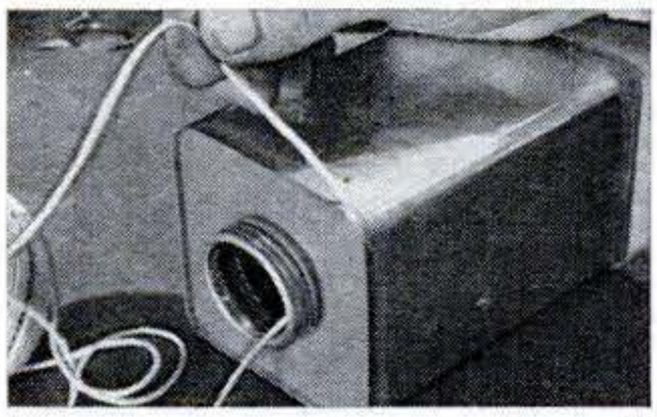


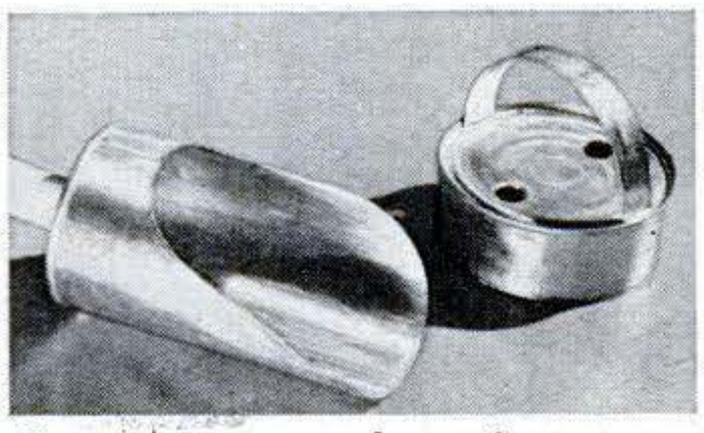
Coaster is tin over wood. Pattern was engraved by tapping nail set and screwdriver with hammer. Felt, cut from old hat, was glued to bottom.

Simple project is wall or shelf bracket to hold oil can or can of cleansing powder. Snip can to shape as if you were making a scoop for flour or grain.





Square can, wrapped with cord, is lamp base. Cord is started in hole punched in can. Inside end is knotted. Now see photos below.



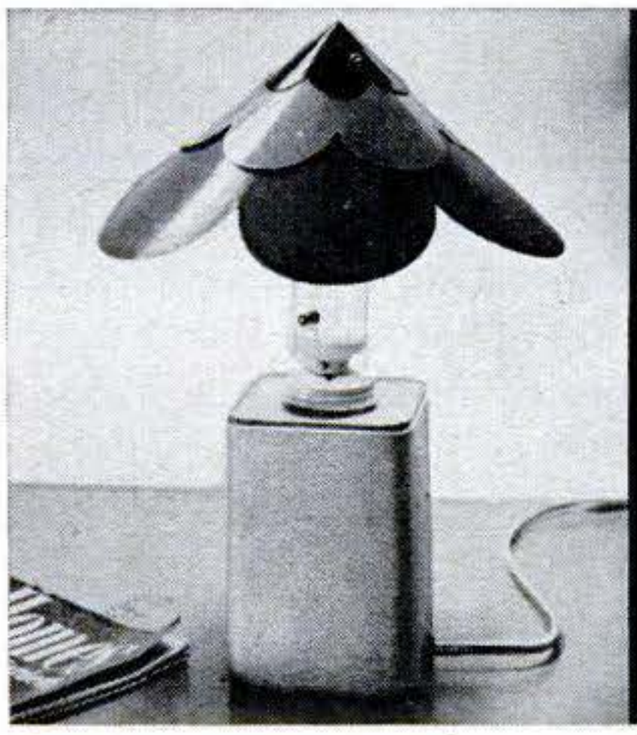
Scoop was cut from fruit-juice can. Handle is 5" piece of broomstick nailed on. Biscuit or cookie cutters can be made any size you like.

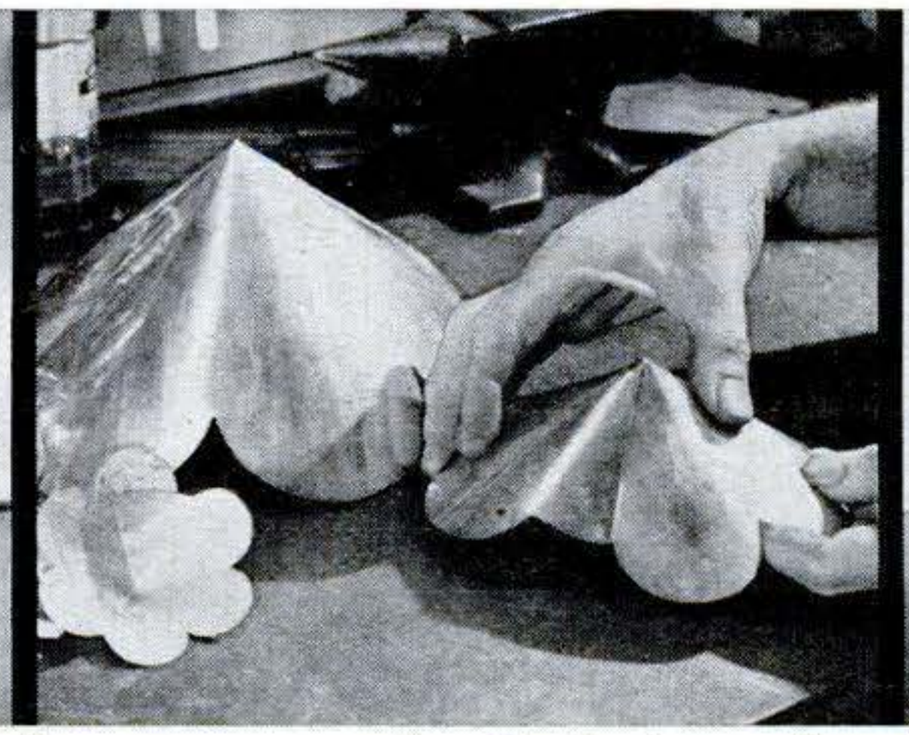
Can lids and strips of tin form hurricane lamp. Parts are soldered together. Note air-inlet holes punched near bottom of chimney holder.

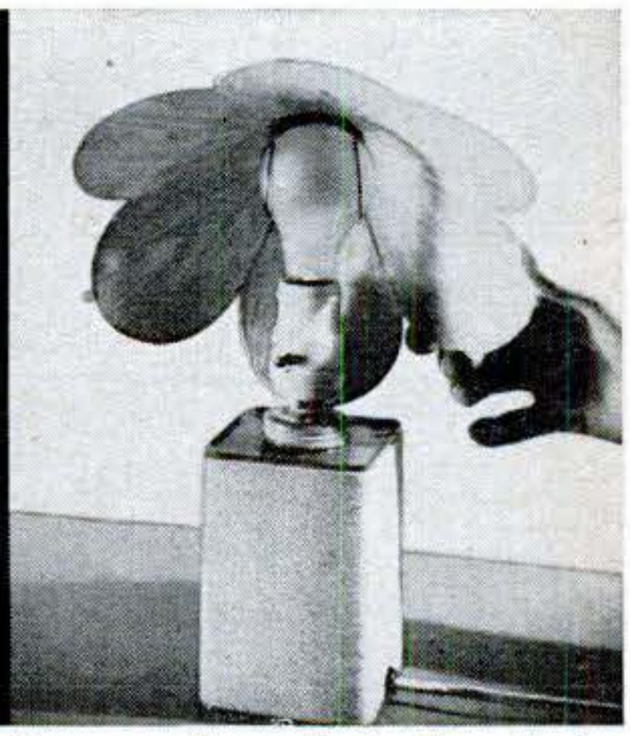
Do You Throw Tin Cans Away?

USES for empty tin cans are practically endless. And one of the nicest features is that you get your raw materials for nothing. Then, too, you only need a couple of simple tools—tin snips and a soldering iron.

For example, the hurricane lamp pictured above has a coffee can for a base and the bottom of a smaller can as the base for the candle. Strips of tin made the candle cup and handle.—*Walter E. Burton, Akron, O.*







Cord was cemented to metal as it was wound on in one, even layer. Then cord was shellacked, ends of can painted, and lamp wired (left). Shade (center) is three scalloped circles of tin. Disks are slit to center, bent so two scallops overlap, and then soldered. Wire clip grips bulb.

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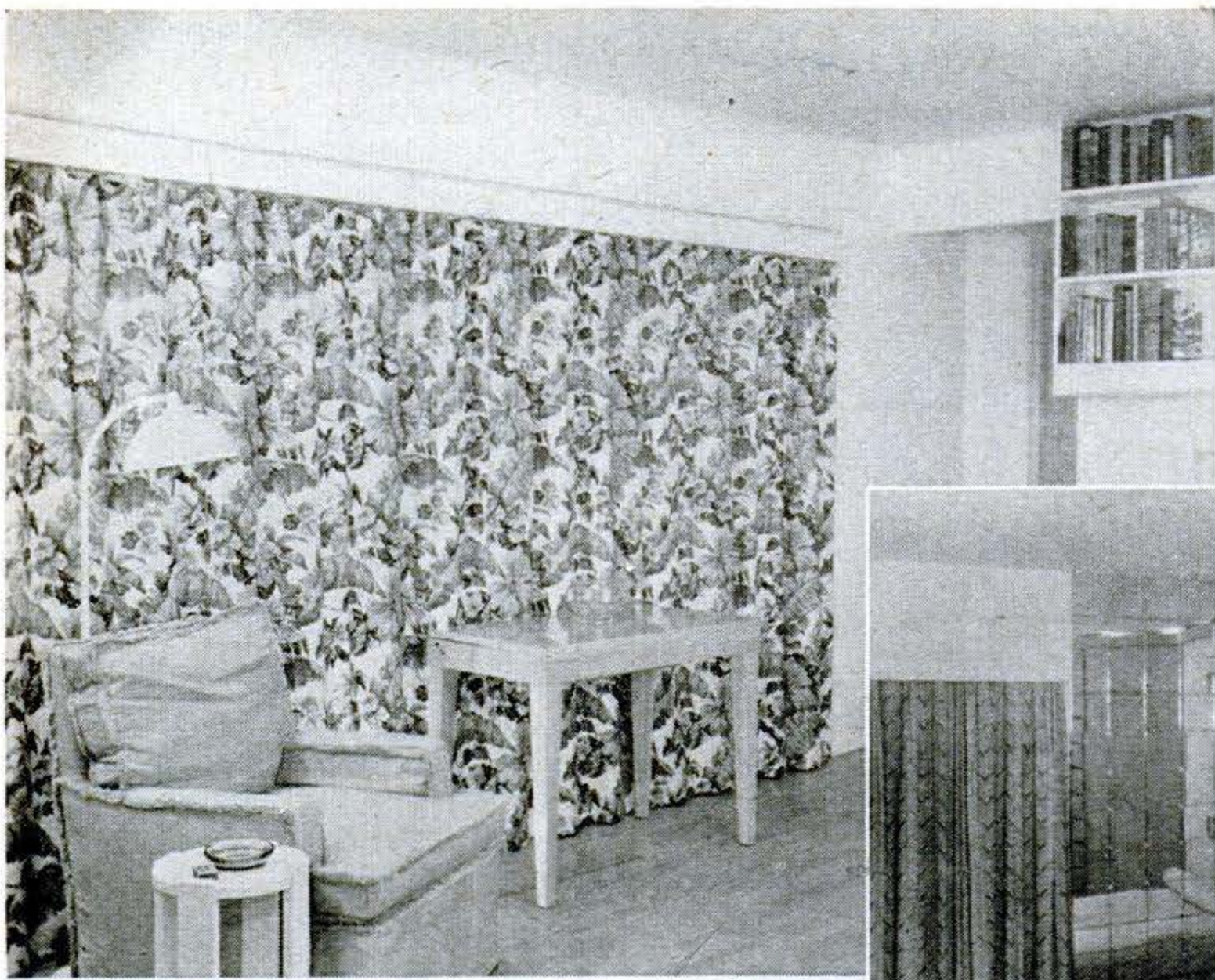
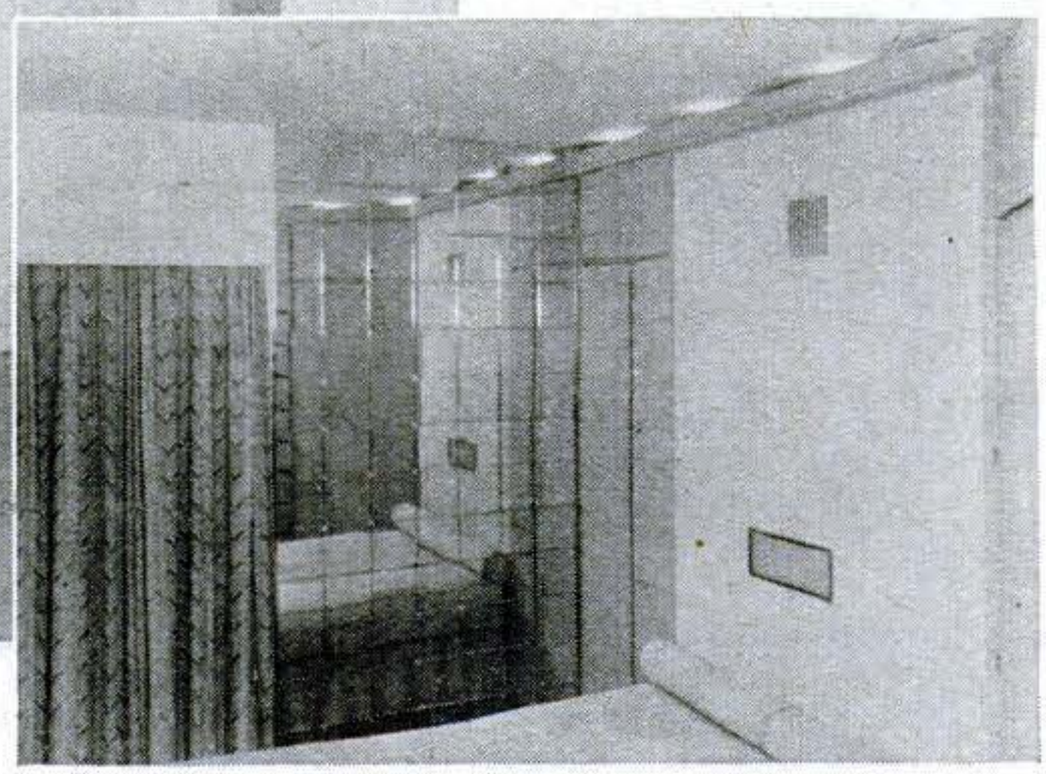


Tiny bedroom below is lighted indirectly from trough at the ceiling line on built-in storage wall. Mirror panel on far wall makes room look larger by reflecting pattern of lights.

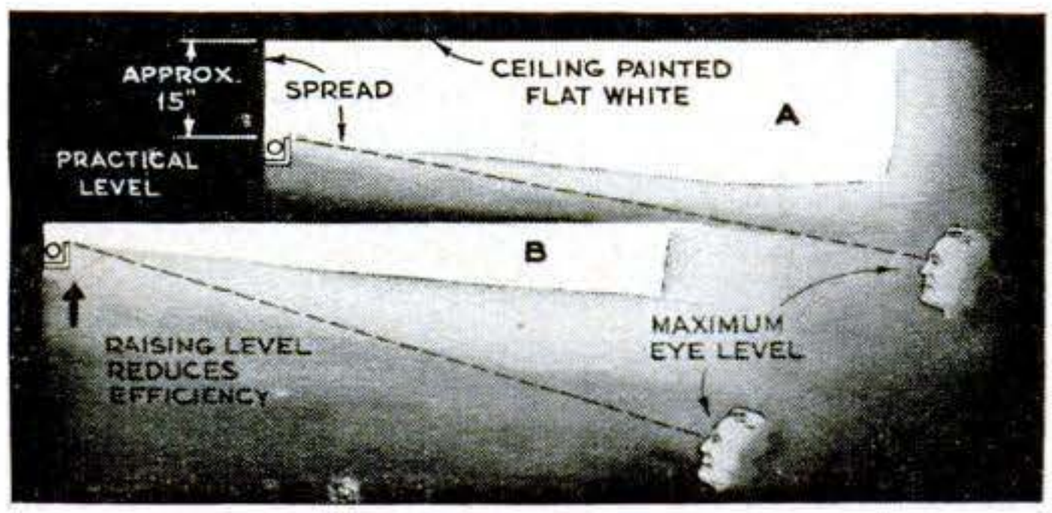


Lights in trough that supports the drapery track illuminate the room above indirectly.

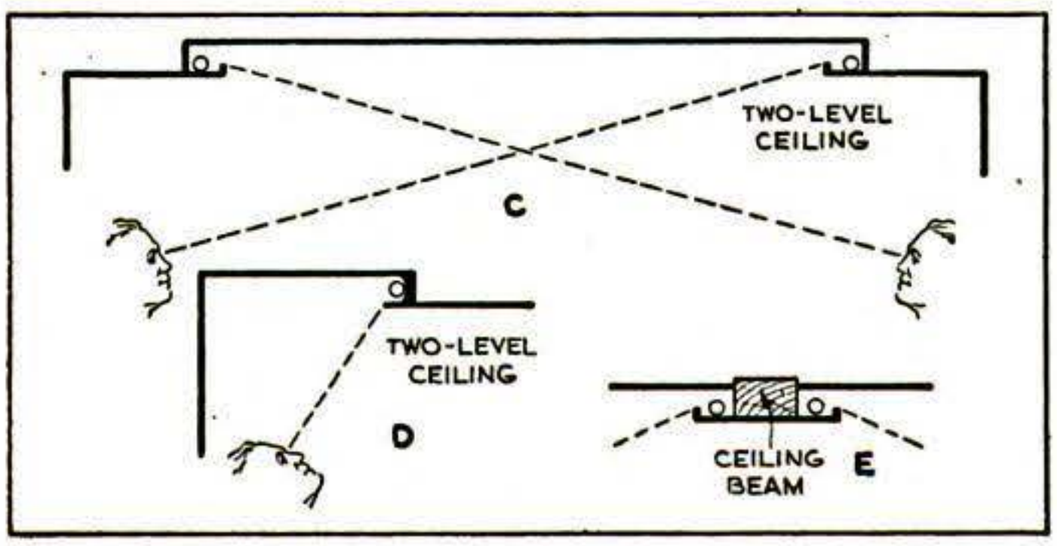
Should You Hide Your Lights?

These tips on building indirect lighting into your home can help you to brighten it up.

By John Modroch



Raising the light reduces spread.



Two-level ceilings can be used nicely.

BUILT-IN sources of indirect light can increase the comfort, improve the appearance, and heighten the efficiency of the illumination in many homes.

Your eyes are naturally receptive to diffused overhead illumination such as they encounter out-of-doors on slightly cloudy days. Hence, a broad spread of light reflected off the upper walls and ceiling of a room is desirable for general lighting. It brings that soft, outdoor light right into your living room.

To produce such indirect, general light, the lamps should not be too close to the reflecting ceiling. The position of the lamps and the construction of the enclosing trough should, however, keep the light above maximum eye level—that is, above the line of sight of a tall person looking at it from the farthest point in the room.

In average rooms having eight-foot ceilings, the most practical place is likely to be along the walls just above doors and windows. Lamps can be conveniently concealed on ledges, in troughs, or in shells; and the light can spread over the ceiling enough to illuminate a fairly large room. In small or

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narrow rooms, where the light need not be spread so far, the light sources can be higher. But a higher level cuts the spread.

Indirect lighting also can be provided by constructing or taking advantage of a two-level ceiling. Rooms with beamed ceilings are easy to light indirectly, and sometimes a recess along just one side of a room will provide as much general light as is needed.

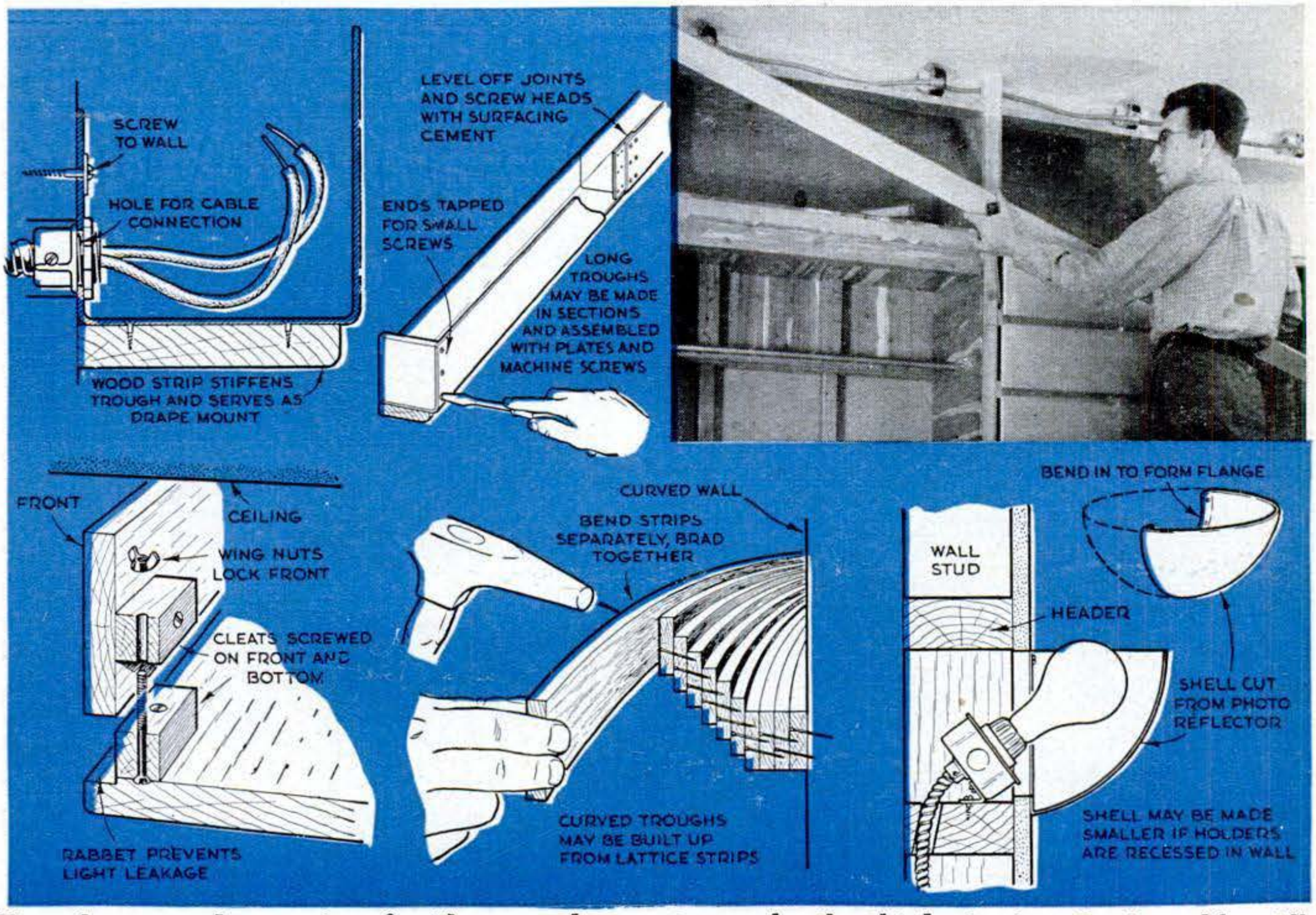
Determining the Intensity

How intense indirect general lighting should be depends on the way the room is used. Low to medium intensity is likely to be best in a living room where several lamps provide bright light for reading and other close work. In this case the general light should be just strong enough to strike a comfortable eye balance with the reading lights.

One way to determine the proper amount of light for a particular set of conditions is to build a test trough. Make it large enough to get a good sample—say a half or quarter of a room. You can then get a good visual indication of how well that section of the room can be lighted indirectly.

If you have or can borrow an exposure meter of the kind used in photography, take a few sample readings in rooms that you consider well lighted. Then compare them with the readings you get from the test trough. And while you're at it, try lamps

Building a test trough.



Troughs may be made of either wood or metal. A few methods of construction are suggested in these sketches. Metal housings should be grounded either by armored-cable connectors or by the third wire in a 3-wire cable. All wiring installed in nonmetallic troughs should be carried in sheathed or armored cable. Metal outlet boxes act as safeguard against fire.

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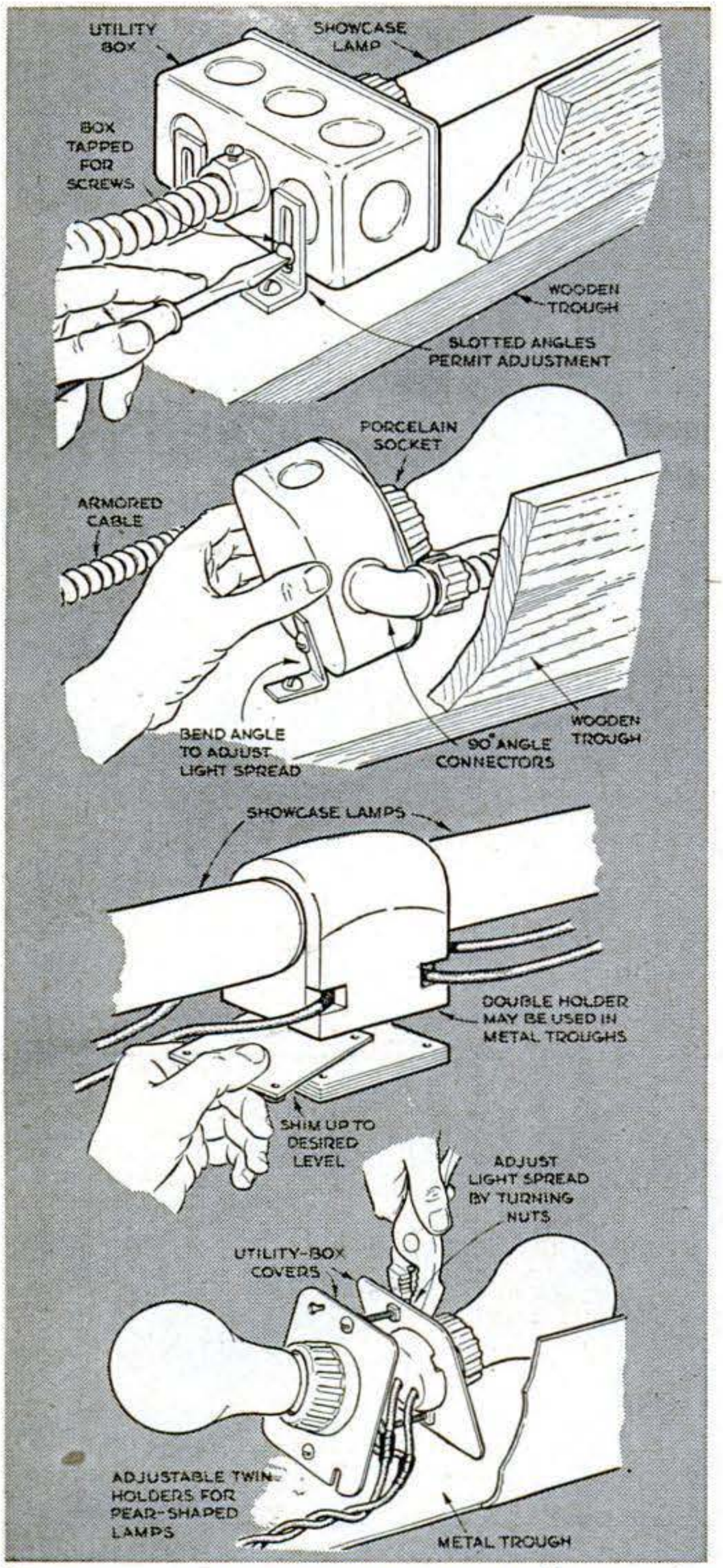


Here are a few ways to mount sockets in the troughs. Adjustment of the angle and height of the socket helps to regulate the light spread.

of different color temperatures (roughly, degrees of whiteness). Your lamp dealer should be able to show you color charts of some of the more common lamp styles from cool blue to sunny yellow.

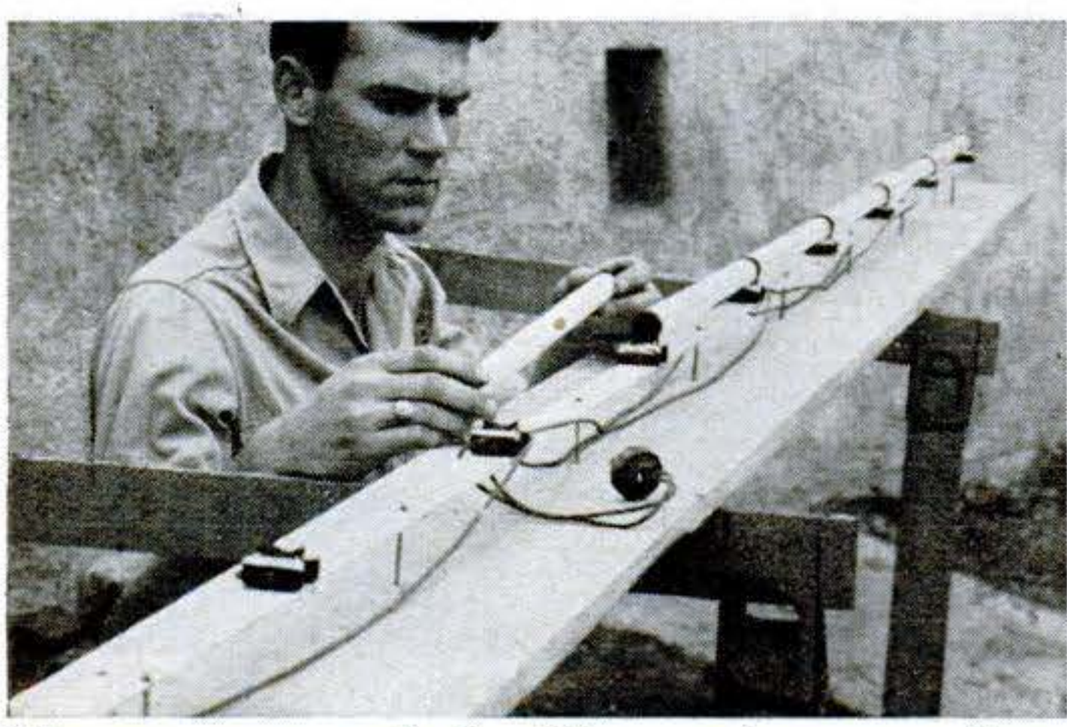
A combination of indirect lights often gives a good compromise in both intensity and temperature. The trough in the dining-living room shown at the top of page 192 contains two circuits. One has white fluorescent lamps for full illumination; the other uses incandescent Lumiline® lamps wired in series-connected pairs. Wired this way, the latter produce warm, low-intensity illumination of candle-flame quality.

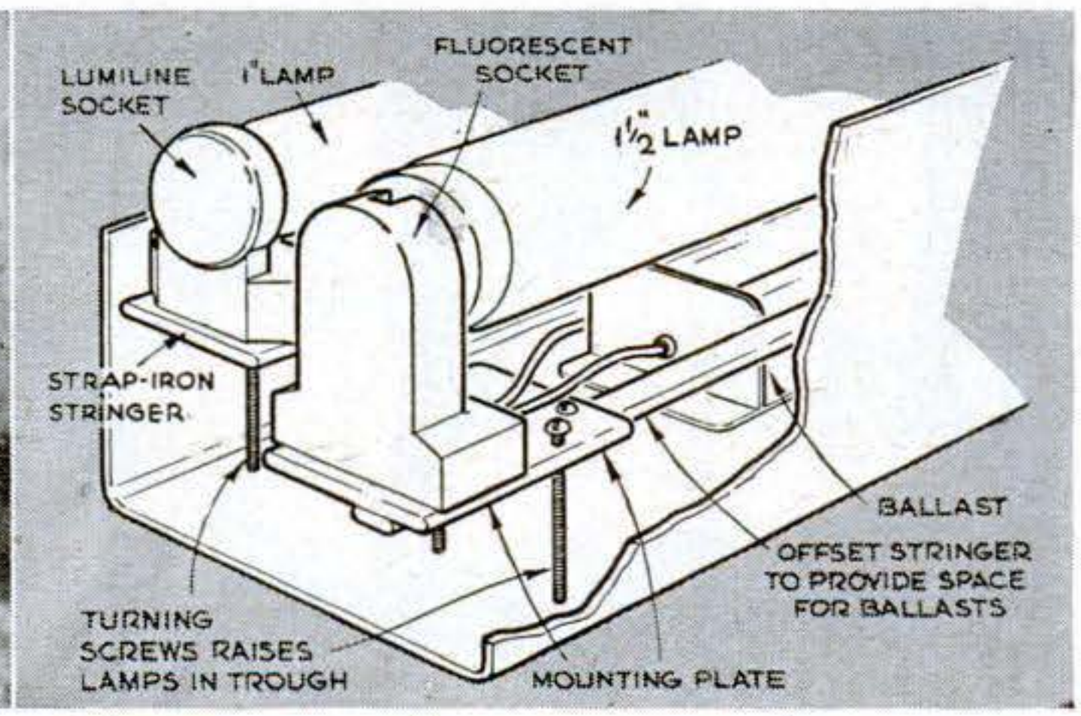
Troughs and Fixtures

The actual choice of lamps—and therefore the arrangement of sockets—will depend upon the physical position and size of the trough.

To avoid operating failures, certain general precautions should be observed:

- Housing for high-temperature filament lamps must be large enough so that no part of the fixture touches the glass. Cracking of the bulb, due to rapid cooling at the point of contact, may otherwise result.
- Reflectors used in housings that offer little or no ventilation should be adjusted so that any beam produced by the reflector is not concentrated on the lamp. Pin-pointing the heat back to the bulb may blister the glass or loosen the filament supports.
- Because of their low operating temperatures, fluorescent, filament tubular, and low-wattage incandescent lamps are free of some of these overheating dangers. Remember, though, that fluorescent ballasts need ventilation. END





Fluorescent or tubular filament lamps can be mounted on strap-iron stringers. Fluorescent stringers are made narrower as shown to provide space for the ballasts in the same trough.

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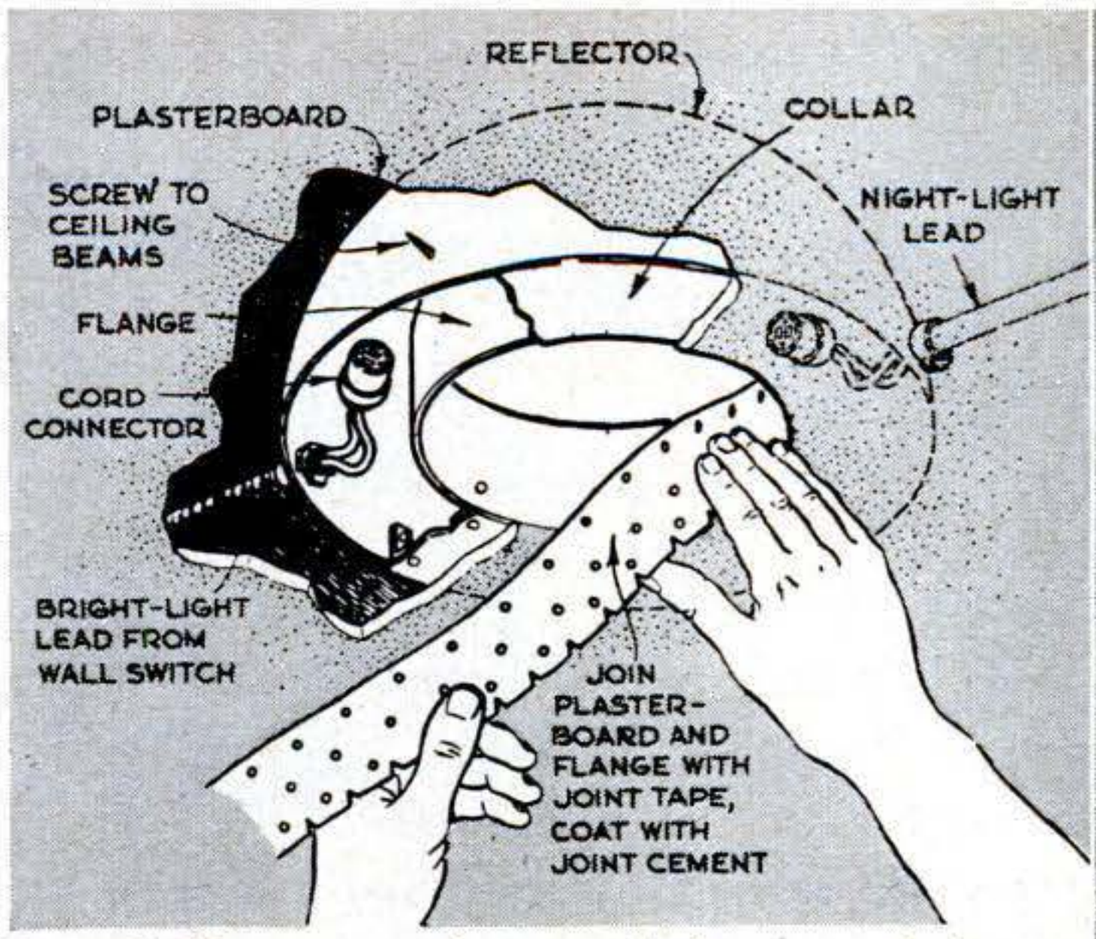
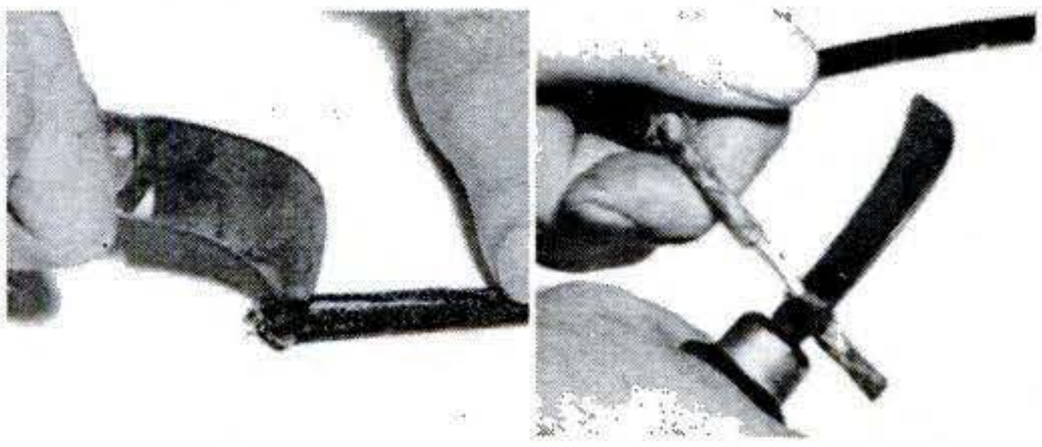


In a hallway, or wherever light is needed in only a small area, the compact ceiling unit shown here can be installed between the joists. If possible, it's desirable to install the unit before the ceiling board or laths and plaster are put on. Two circuits are shown. The bright lights are controlled by a switch in the hall; the glow lamps are wired to a remote-controlled night-light circuit.

Linoleum Knife Strips Wire

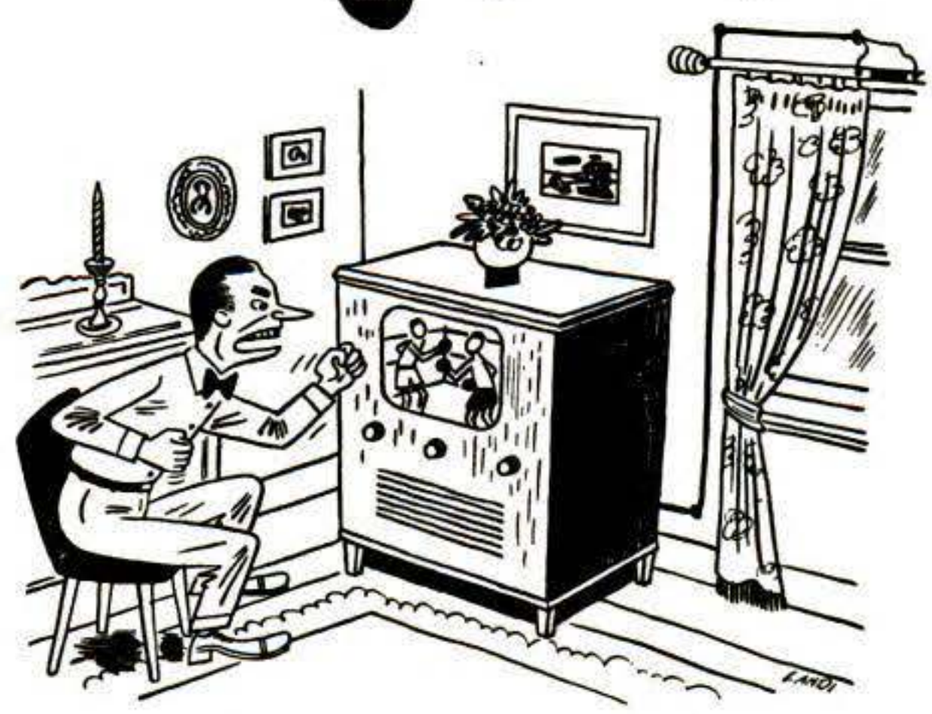


A HANDY tool for stripping insulation from electrical wire can be made by grinding a sharp-edged notch in the blade of a linoleum knife, as seen in the photo at the left above. After the insulation has been slit with the pointed blade, the notch can be used, as at right above, to sever and slice it off.—*Evan Wright, Topeka, Kan.*

Old Shoes Make Tool Holster

FOR a convenient holster in which to carry small tools, cut the heel section off an old shoe and attach the front part to your belt. Slip wire through the lace holes and form a loop to hold a hammer. Nails can be carried in the toe of another shoe.

The Height of Ingenuity



I bought a TV set. Then I discovered the landlord wouldn't stand for a roof antenna. I thought of an indoor antenna. No indoor antenna, my wife said; it louses up the decor. But I got the aerial anyway, and both my wife and landlord are happy. What's my dipole?

While my wife was out shopping for a fresh load of decor, I remounted a curtain rod on two standoff insulators. A plastic spacer divided the rod in the center. I soldered the double lead-in wire to the two pieces of rod and turned on the set.—Richard D. Sklenar, Omaha, Neb.

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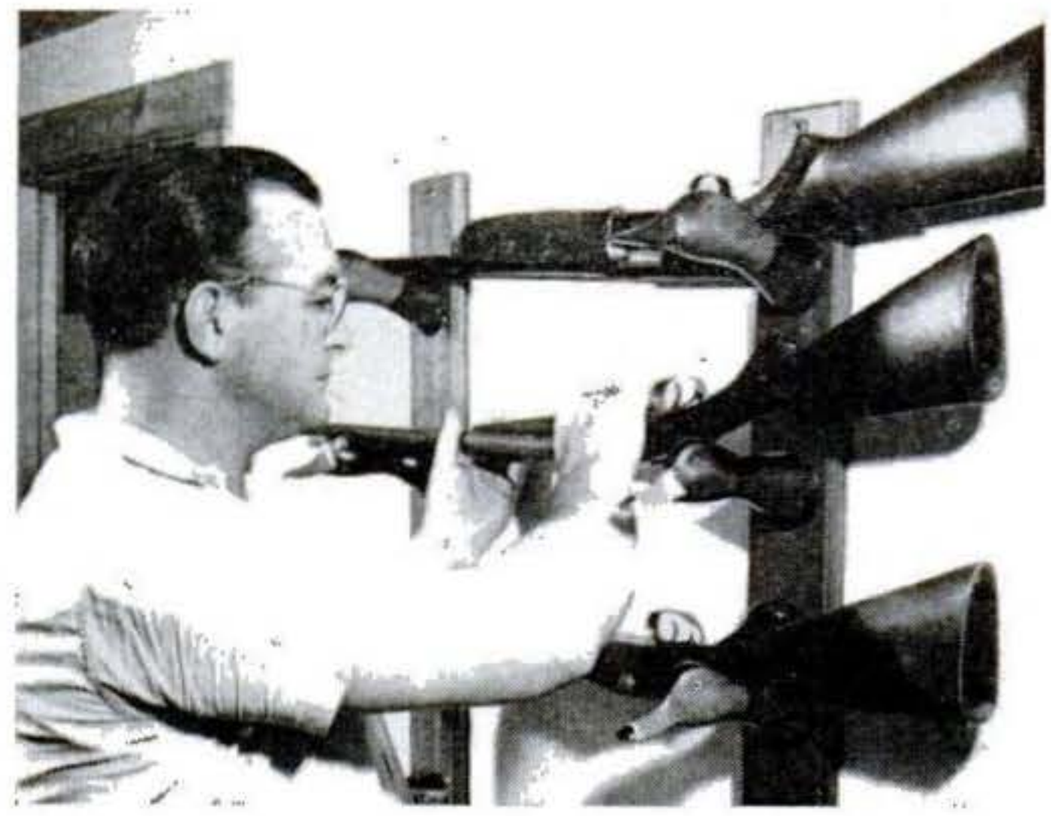
Auto Jack Lifts Snow Plow

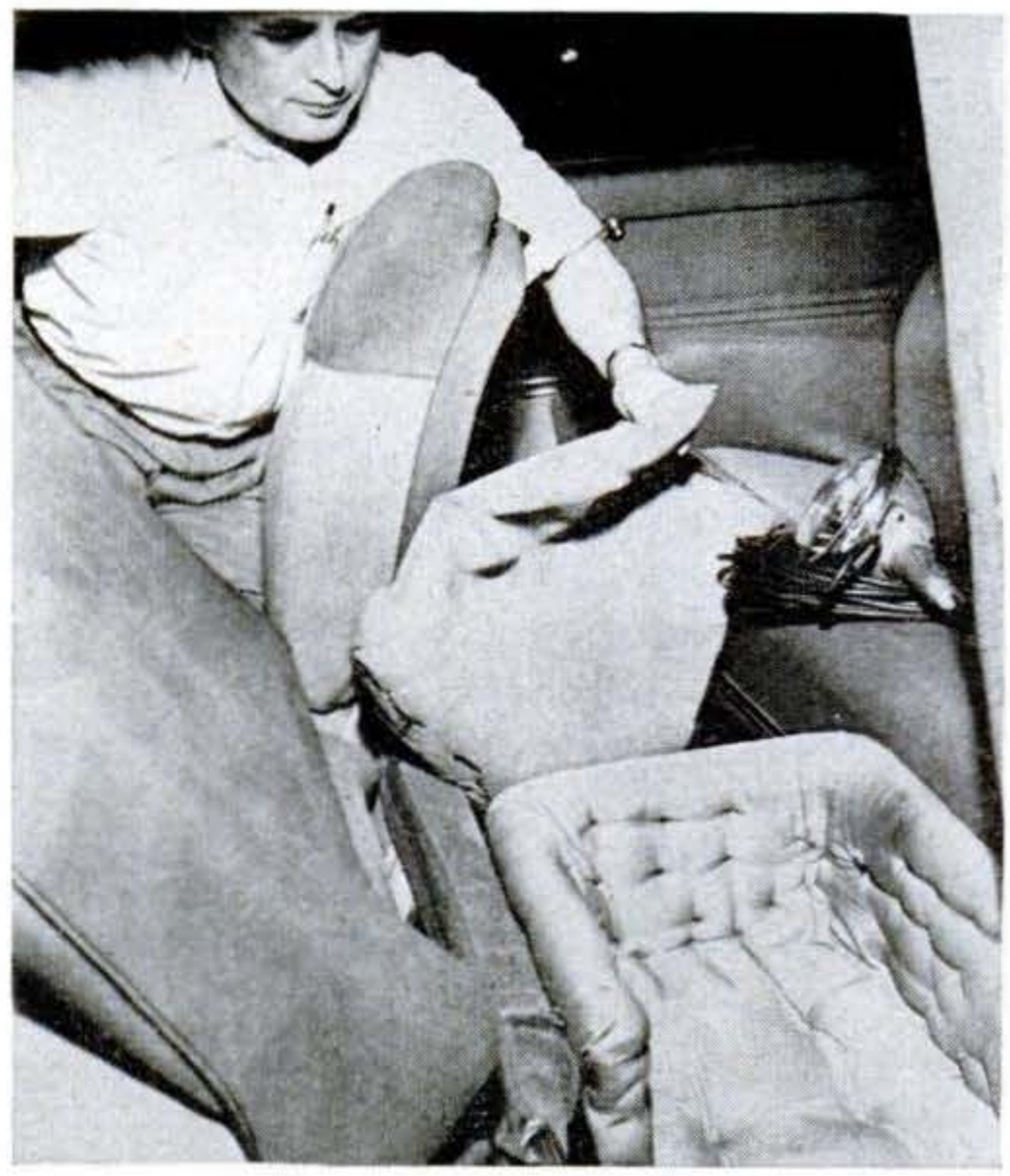
AN ORDINARY hydraulic jack supplies the muscle that lifts the snow plow pictured above and below. The base of the jack is bolted to a section of channel iron that pivots between the two upright pieces. As the photos show, the top of the jack works against a lifting arm. One end of the arm is welded to a crosspiece that also pivots between the two uprights. A lifting chain is attached to the other end of the arm and to the plow.

I've found this lifting arrangement easier to use than a rig operated by a crank or handwheel from the cab. Of course, I have to get out of the cab to lift the plow. However, the jack does practically all the work, and permits accurate setting. This type of lift could be applied to most homemade plows.—*Phil Palker, Unionville, Conn.*



Duck Heads Support Guns

THESE unusual gun racks are built by the Wildfowler Decoy Co., of Saybrook, Conn. The heads shown are carved for the purpose from softwood, but the heads of old decoys could be used if you build your own rack. An atomizer and masking tape were used to spray-paint the heads, and the bills were then painted by brush. Glass eyes from a toy shop completed the heads. The necks of the ducks were sawed at an angle.



Carrier Protects Camera

FITTING snugly between the front and rear seats of a car, this box protects a camera from dust and jounces. The idea was developed by Langstrom McEachern, photographer of the Shreveport (La.) *Times*, to carry his photo equipment on assignments. The box is lined with sponge rubber.

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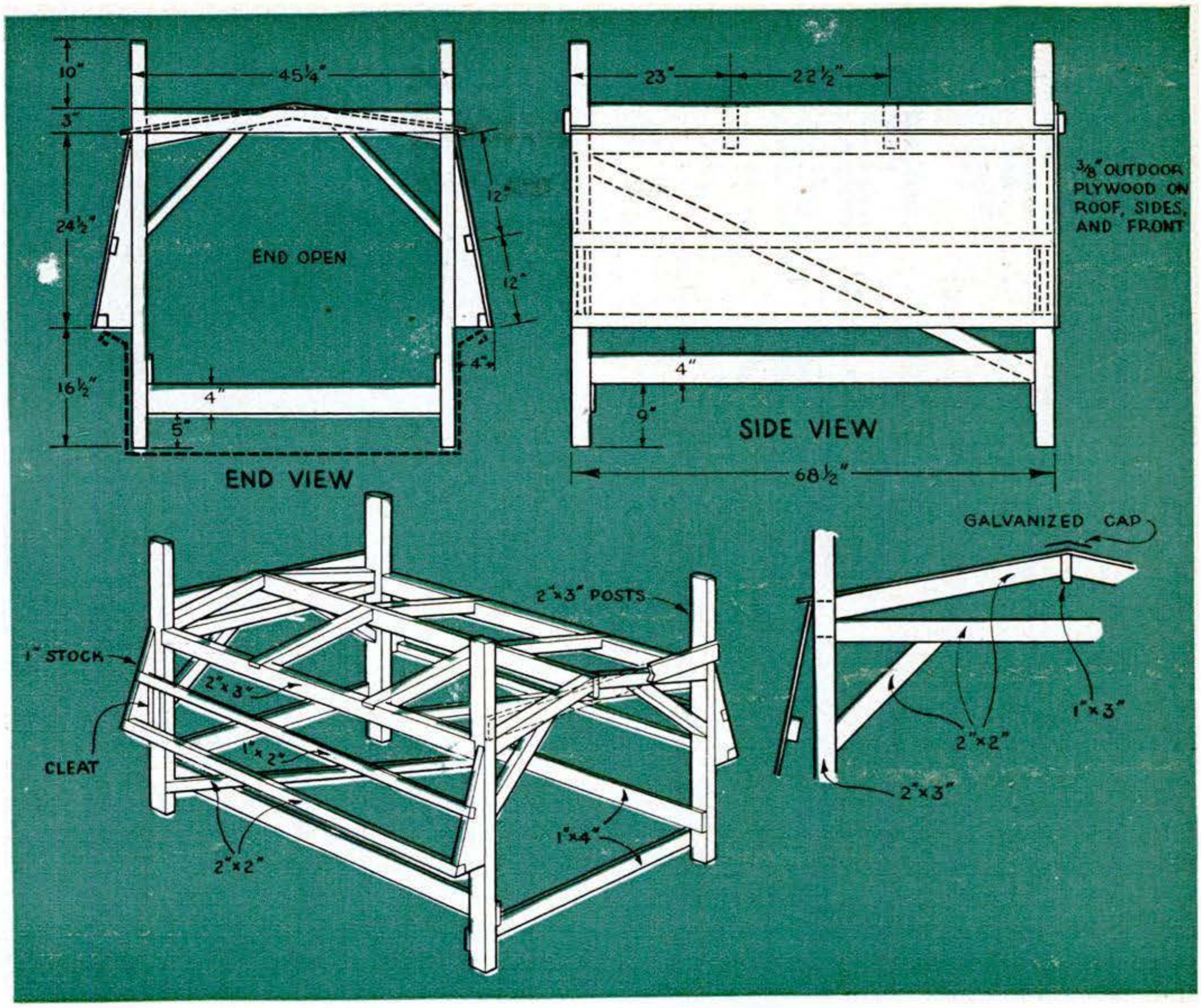
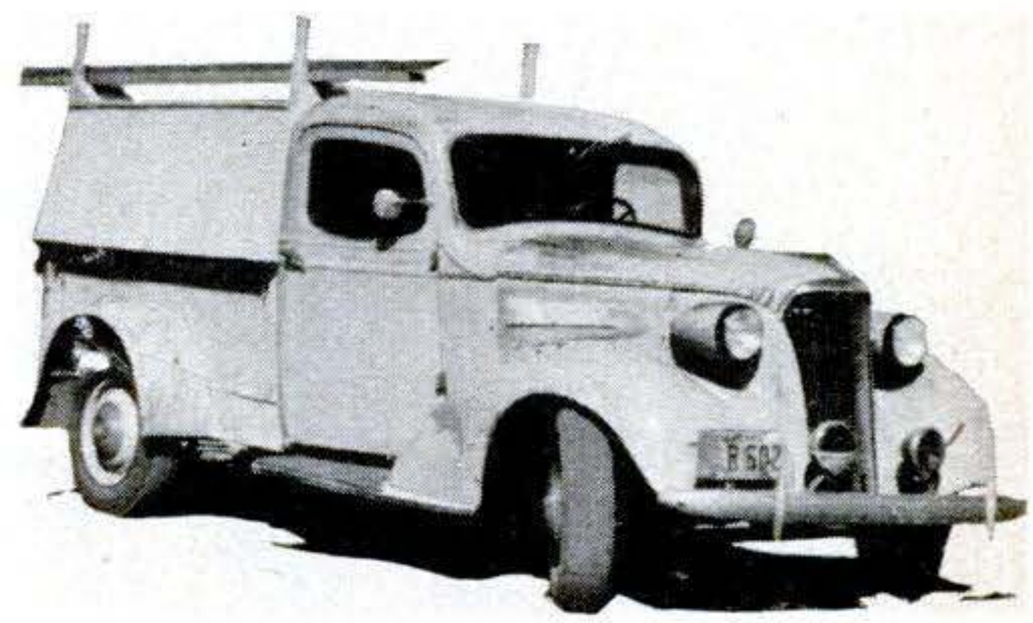


Top for Pickup Truck Lifts Off

Two men can place this top on the body of a pickup truck in a couple of minutes. It requires no bolts or fastenings, being sized to fit just within the body.

The top was built by A. C. McCoy, a San Bernardino, Calif., contractor, so that he could carry his crew under cover when driving to and from a job. The upper extensions of the corner posts make it easy to haul lumber or pipe. As the drawing above shows, the framework is fairly light but sturdy, being well braced throughout. The sides, top, and front end are covered with outdoor plywood. This protects personnel or supplies in rainy weather.

When not in use on the truck, the top serves as a shelter for bags of cement, grain, or other commodities on the ground. It's a business asset in more ways than one, too. The smooth sides provide ample space for advertising signs. And on top of that, it makes a fine playhouse for the youngsters when Pop doesn't need it for his truck.



Covering for body of pickup truck lifts on or off. It fits in truck bed, needs no fastening.

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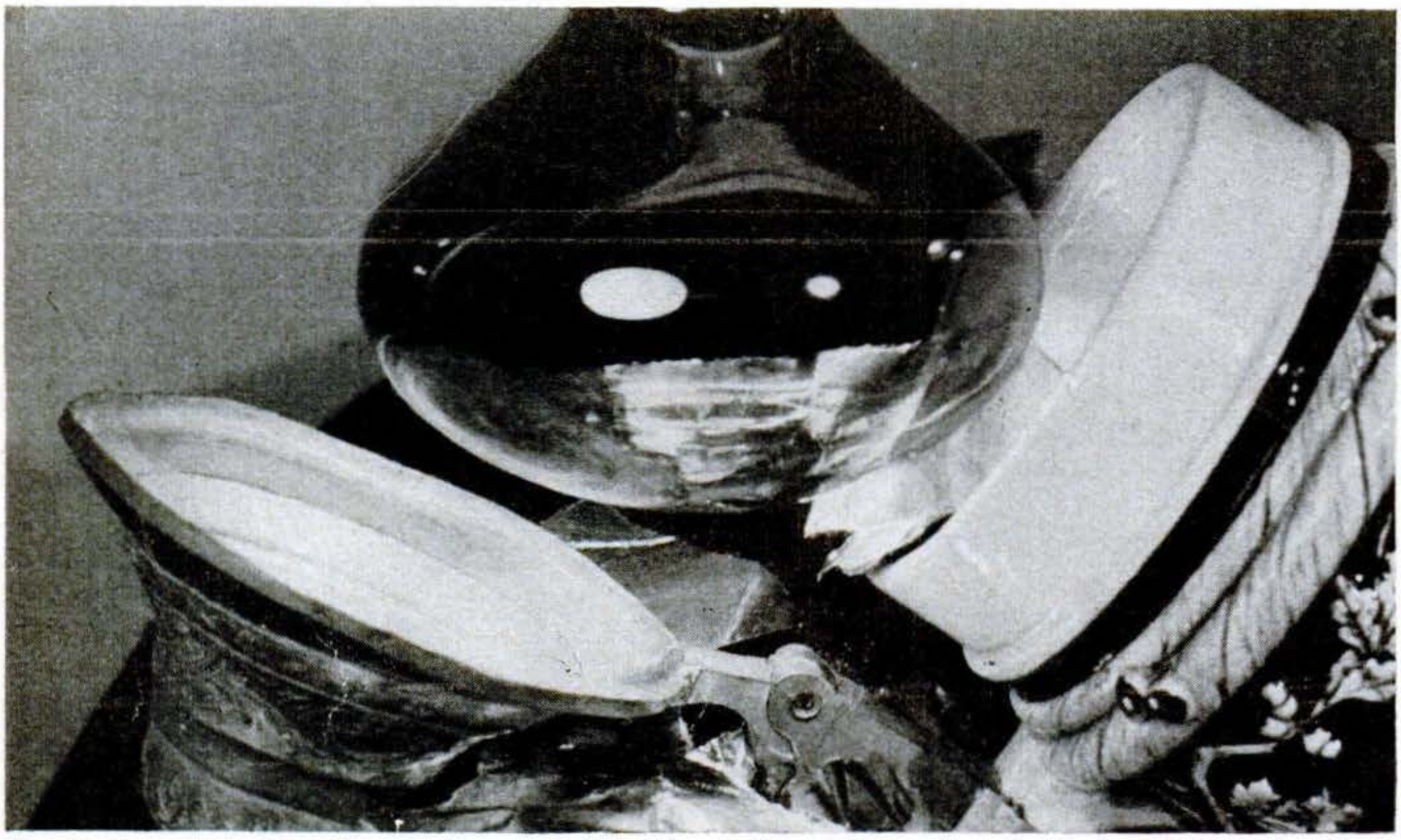
Solder Pastes Make It Easy to Fix Things

By Walter E. Burton

1. It's easy to solder aluminum with these pastes. Here a lens cap is to be made from disk and ring. Alloy is applied to ring joint. Ring is tied shut with wire and heated over gas flame.

SOLDERING pewter with an infrared lamp; silver-brazing with a match flame; or soldering aluminum to stainless steel.

That's just some of the magic you can work with pastes now available to the craftsman. Known as fusion paste-type alloys, they take much of the skill element out of successful soldering. You don't have to be an expert to turn out work with these pastes. They make it possible to do what has always been a tough job in the past—to get really good soldered joints on aluminum. Then, too, there are the low-temperature pastes for electrical joints. You can solder these with the flame of a match. No need to set up your iron for one or two small jobs.



Cracked pewter lid of stein is repaired with low-temperature soldering paste and heat of infrared lamp. Layer of metal foil reduces heat on stein and on sandbag that supports work.

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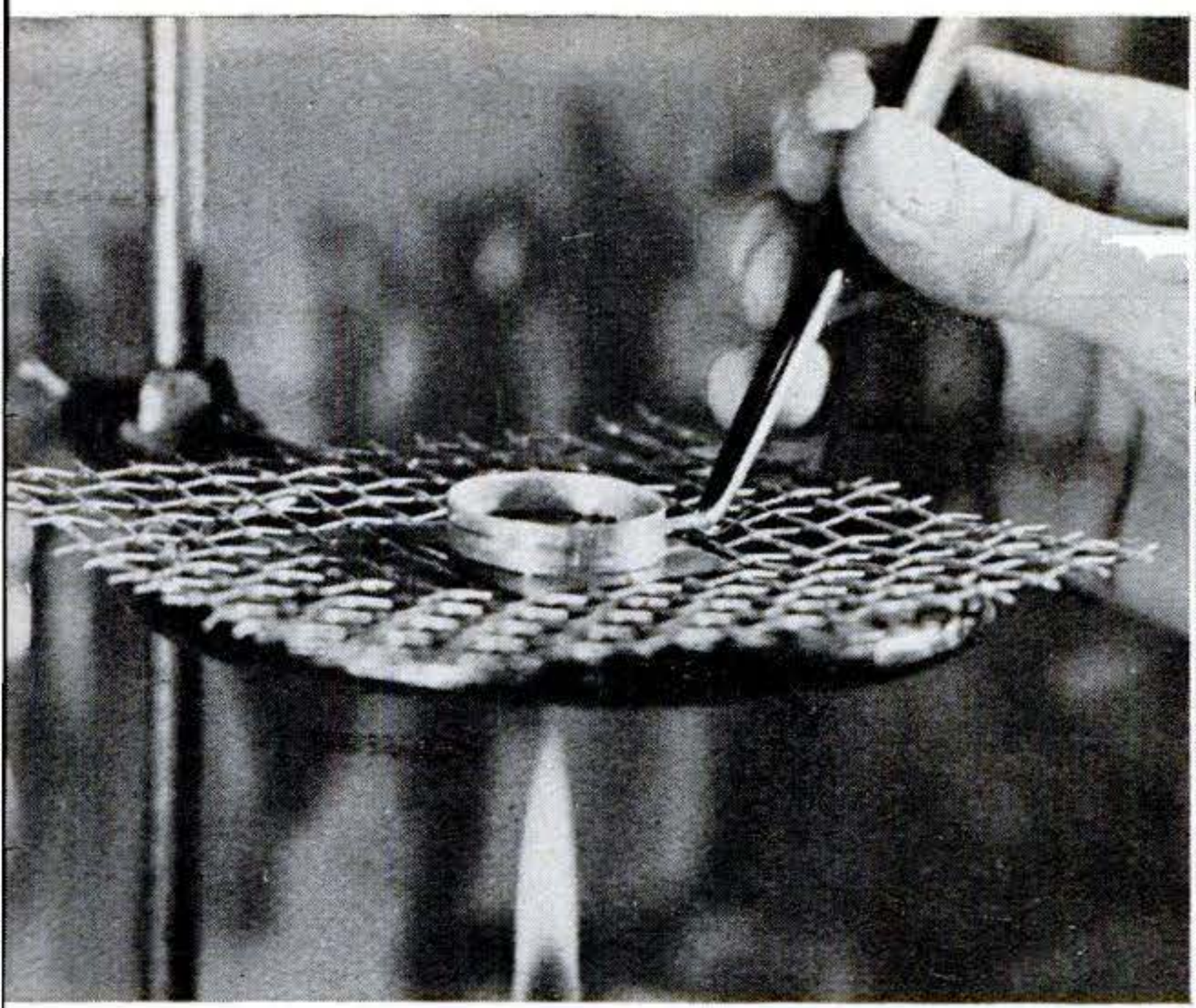
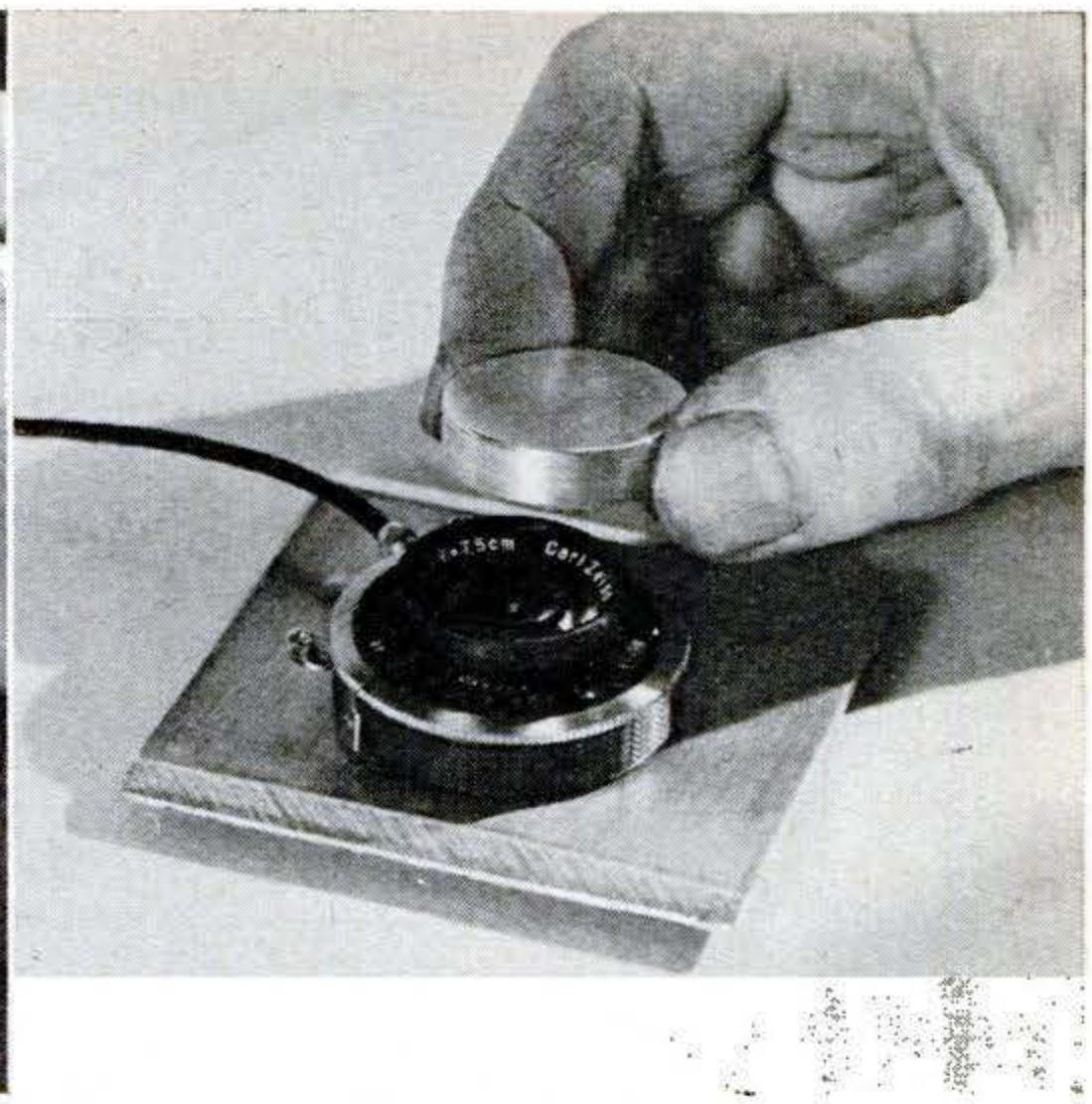


2. Disk and ring are joined. Ring joint is not disturbed because alloy with lower fusing temperature than the one in the ring joint is used here. A Bunsen burner supplies heat.



3. Completed lens cap. After it was smoothed and polished, it was lined with moleskin. Silver-brazing alloy could be used in assembling parts of brass, stainless steel, or other metals.

Fusion Microfilm Alloys®, a product of Fusion Engineering, of Cleveland, have been used industrially for a dozen or so years. Small quantities to simplify your metal-joining problems now are being marketed for the handyman.

They're called microfilm alloys because, in many cases, the paste is said actually to penetrate the grain structure of the metals. Parts to be joined this way can be machined to finished size without allowing for the solder. Some joints can be a press fit and still be soldered.

The solder or brazing material is a chemically formed powder. It may be principally tin, lead, silver, copper, or aluminum. Mixed with it are flux, cleaning agents, and tinning agents. The powders are made into a paste by mixing with water or a petroleum-derived solvent. When you assemble the pieces to be soldered, the paste often can be sandwiched in the joint.

Most of the alloys work at regular soft-soldering temperatures, except a few silver brazing pastes. A few are in the high-temperature class, ranging up to nearly 2,000°. The chart on the next page lists only a few of the pastes—those likely to be used by craftsmen. There are dozens more.

Will Solder Die-Cast Alloys

Materials these alloys will solder include tin, lead, pewter, copper, brass, nickel, Monel metal®, die-cast alloys, carbon steel, alloy steels, stainless steel, silver, aluminum, and tungsten carbide.

As in ordinary soldering, the surfaces to be joined should be cleaned thoroughly. Scrape them, or use steel wool or abrasive cloth. Anyway, get right down to the bare metal before applying a paste. If necessary, clamp or wire the parts together until the soldering job is completed.

Match Does Some Jobs

Heat sources that you can use run from a match to an acetylene torch. An electric soldering iron will do some of the jobs. Those that require higher temperatures will take a torch, though it is possible, as a stunt, to silver-braze thin wires together with a match. An alcohol blowtorch or blowpipe is handy for many operations. And a Bunsen burner will handle a variety of jobs.

After soldering, the work should be allowed to cool to room temperature. You shouldn't quench any soldered or brazed joint to cool it; it may weaken the bond. Scale that remains after cooling can—in most cases—be removed by washing with water. A stiff-bristled brush will help here.

Pewter and lead have been among the most ticklish metals to solder, because their melting point is so near that of ordinary solder. One paste that melts at about 300° simplifies these jobs. In some cases, heating can be done with an infrared lamp of 150-250 watts. In this operation, the

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SOLDERING AND BRAZING PASTES FOR THE CRAFTSMAN

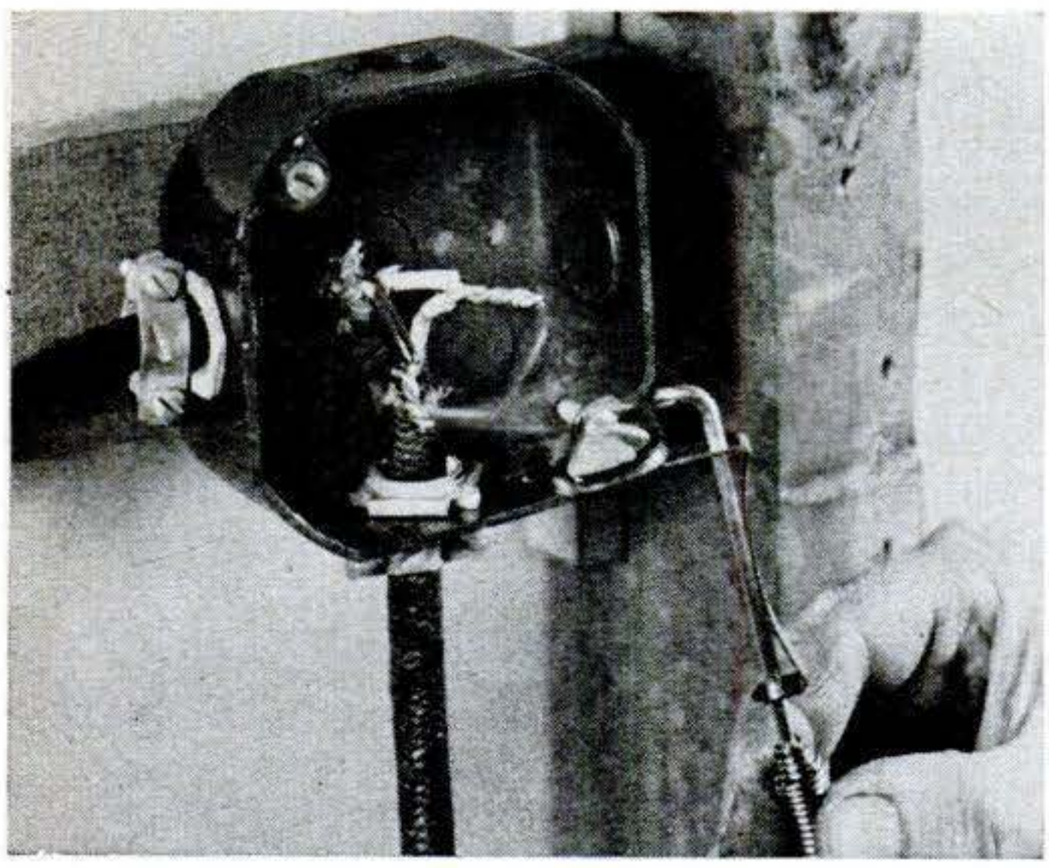
	TEMP. (F.)	TYPE OF PASTE	NO.	USES
GENERAL PURPOSE	300-345	General duty. Solvent mixed.	G-301	Pewter, lead. Produces good fill.
	450-485	Acid type. High strength. Solvent mixed.	GA-451-HS	High-strength joint. Dirty surfaces. Metals hard to solder. Suitable for stainless steel.
ELECTRICAL WORK	450-495	Solvent mixed.	E-450	Ordinary electrical connections.
	425-460	Rosin type. Solvent mixed.	E-425-HR	Where rosin flux is specified.
SILVER BRAZING	1050-1125	Water mixed.	S4-1050	All purpose. Jewelry; steel brazing. Where little fill is needed.
	1100-1150	Special alloy. Water mixed. Contains 35% silver.	S4-1100	Saw blades. Has better filling action than above.
ALUMINUM SOLDER	500-550	Water mixed.	A-500	Tinning and bonding aluminum.
	750-850	Solvent mixed.	A-750	Joins aluminum to aluminum and to other metals.
SOLDER FOR DIE-CAST ALLOYS	400-450	Water mixed.	D-400	For tinning and soldering pot metal and die-cast alloys.

lamp is placed very close to the work—about ½″ from it.

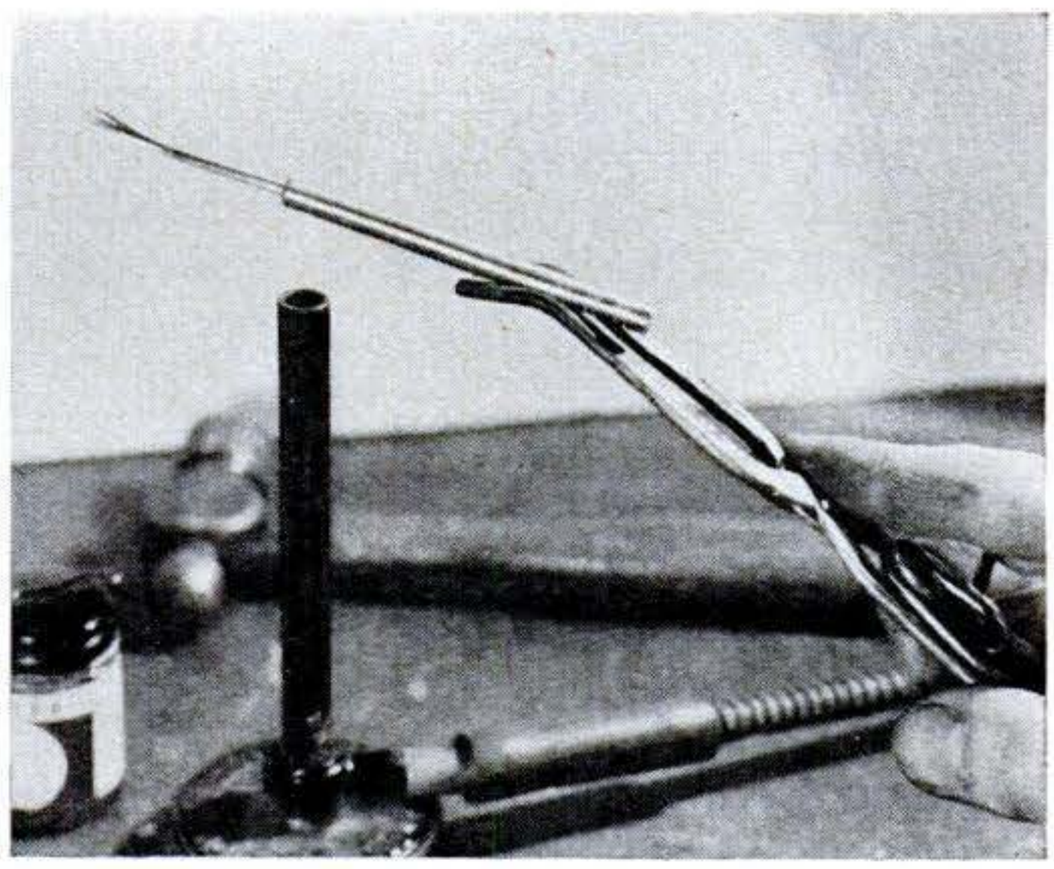
The aluminum solders, one having a fusion point of 500° and another of 750°, have opened new fields to the home craftsman. These solders seem to work better on some aluminum alloys than with others. A good test is to put a bit of the paste on the aluminum you want to solder and heat the metal over a gas burner. The paste will work if it spreads and "wets" the surface of the aluminum.

The brazing alloys offer the craftsman a convenient way of assembling articles made of steel, silver, stainless alloys, and copper. A properly made silver-brazed joint is extremely strong. If you select pastes with different fusion points, two or more joints on the same piece may be soldered in sequence, provided you first use the paste that has the highest melting point. Pieces to be joined should fit together closely, with little or no clearance.

Prices of the pastes range from 30 cents an ounce for the low-temperature ones to about $1.50 an ounce for silver alloys. END



Small pellet-fueled blowpipe supplies heat to solder connections in junction box. One paste is specifically for electrical work. Some pastes of this type will melt in the heat of a match.



Length of aluminum welding rod and stainless-steel wire combine to make a pickle fork. Alloy was placed in handle, wire inserted, and assembly heated in flame of Bunsen burner.

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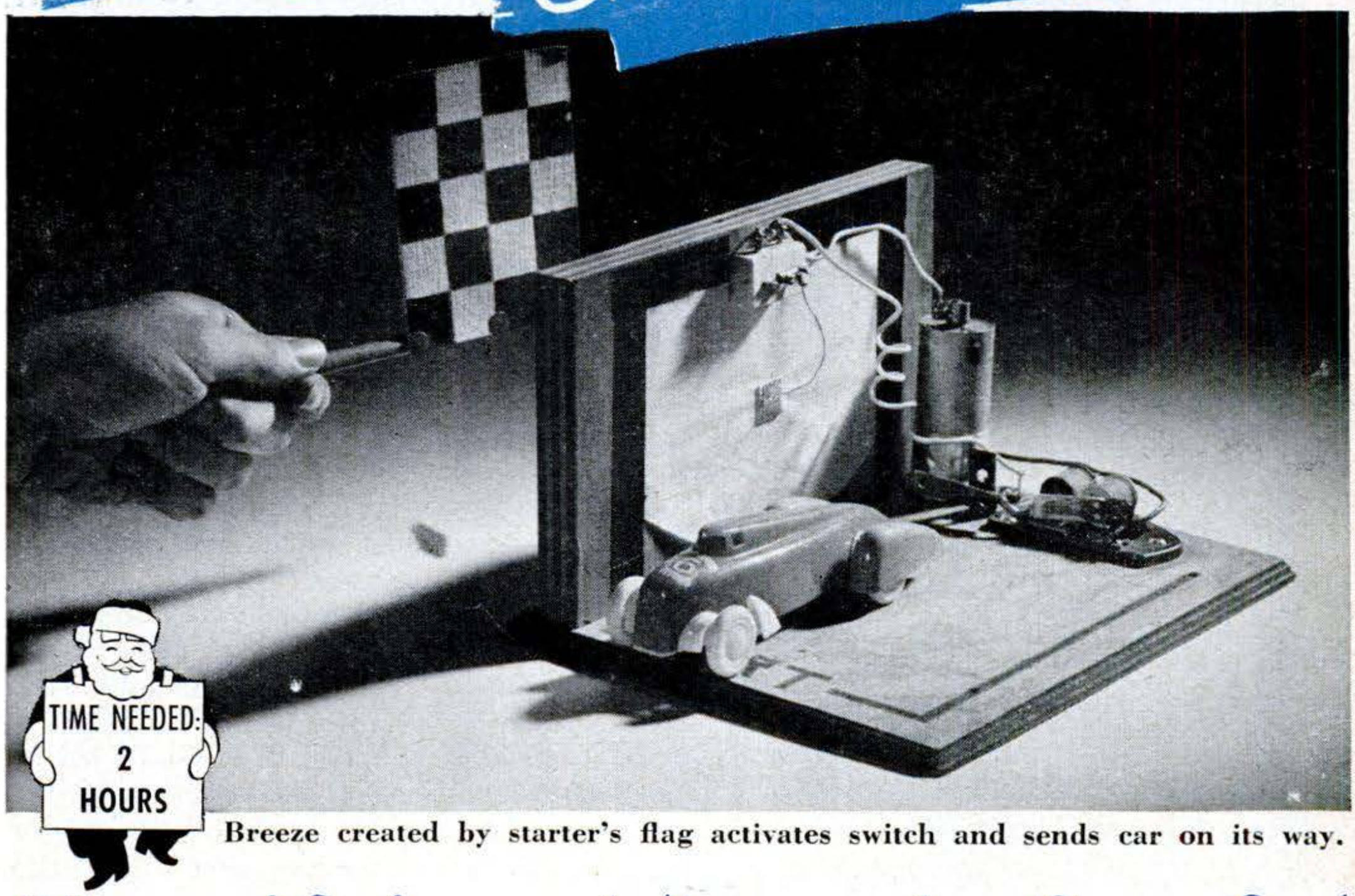
A Dozen Last Minute Christmas Ideas

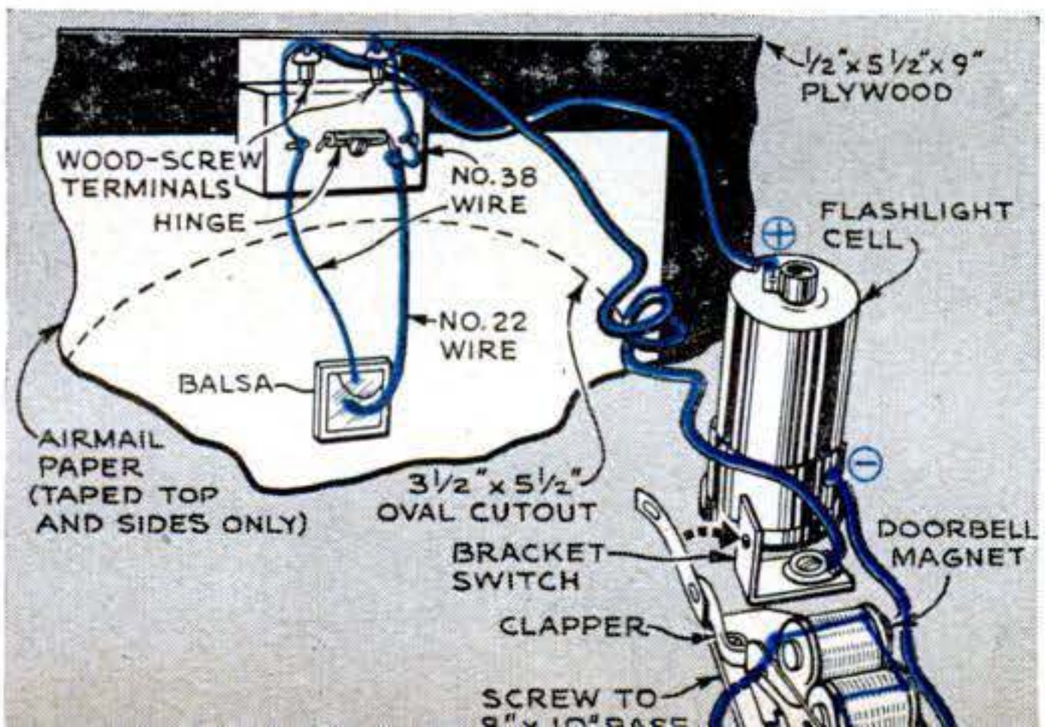


Breeze created by starter's flag activates switch and sends car on its way.

Shout 'Go'—and Away the Cars Go!

WHAT are you going to give that small boy who has more cars than a fleet operator? Here's an electric starter you can make for him. With it, he can send a car racing across the floor by waving a flag, clapping his hands, or shouting "Go!" And it's simple enough for a four-year-old.

A single flashlight cell and a doorbell buzzer provide the electric snap. The starting post consists of a couple of pieces of scrap wood, a sheet of air-mail paper, and a homemade sensitive switch triggered by a paper diaphragm. A breath of air or a sharp sound breaks the circuit. The electromagnet of the doorbell then releases the springy bell-clapper that starts the car across the floor.



An oval is cut out of the wooden upright and air-mail or onionskin paper taped over it. The contact on this paper is a small piece of tin-can metal cemented to a square of thin balsa that's cemented in turn to the paper. Hanging down and just touching the tin-can metal is a piece of wire that hinges in ⅛" copper tubing. Fine-wire leads are soldered to the hinge and to the tin-plate square.

The cover, bell, hammer, and stationary vibrator contact are removed from the doorbell. Then a 1½" extension is soldered to the clapper. A 1" angle iron is screwed to the base, not touching the doorbell frame. The angle is located so it just touches the clapper-arm extension when the clapper is pushed back against the magnets. Wire the bell as shown. It will draw no current until it is "cocked" by pushing the clapper back. Don't let the child leave it cocked too long. END

For More Christmas Ideas, See the Next Seven Pages

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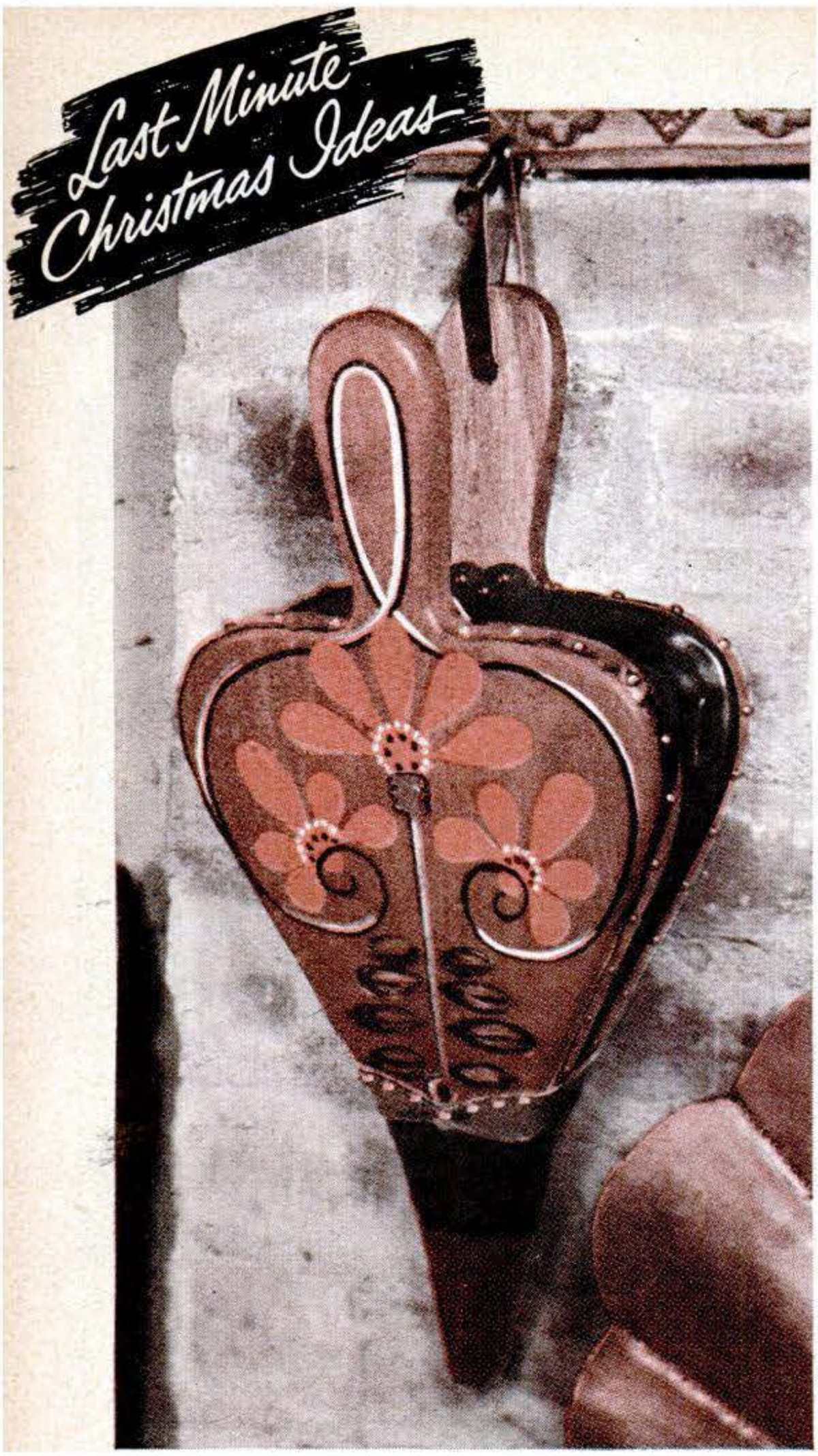


To Keep Home Fires Burning

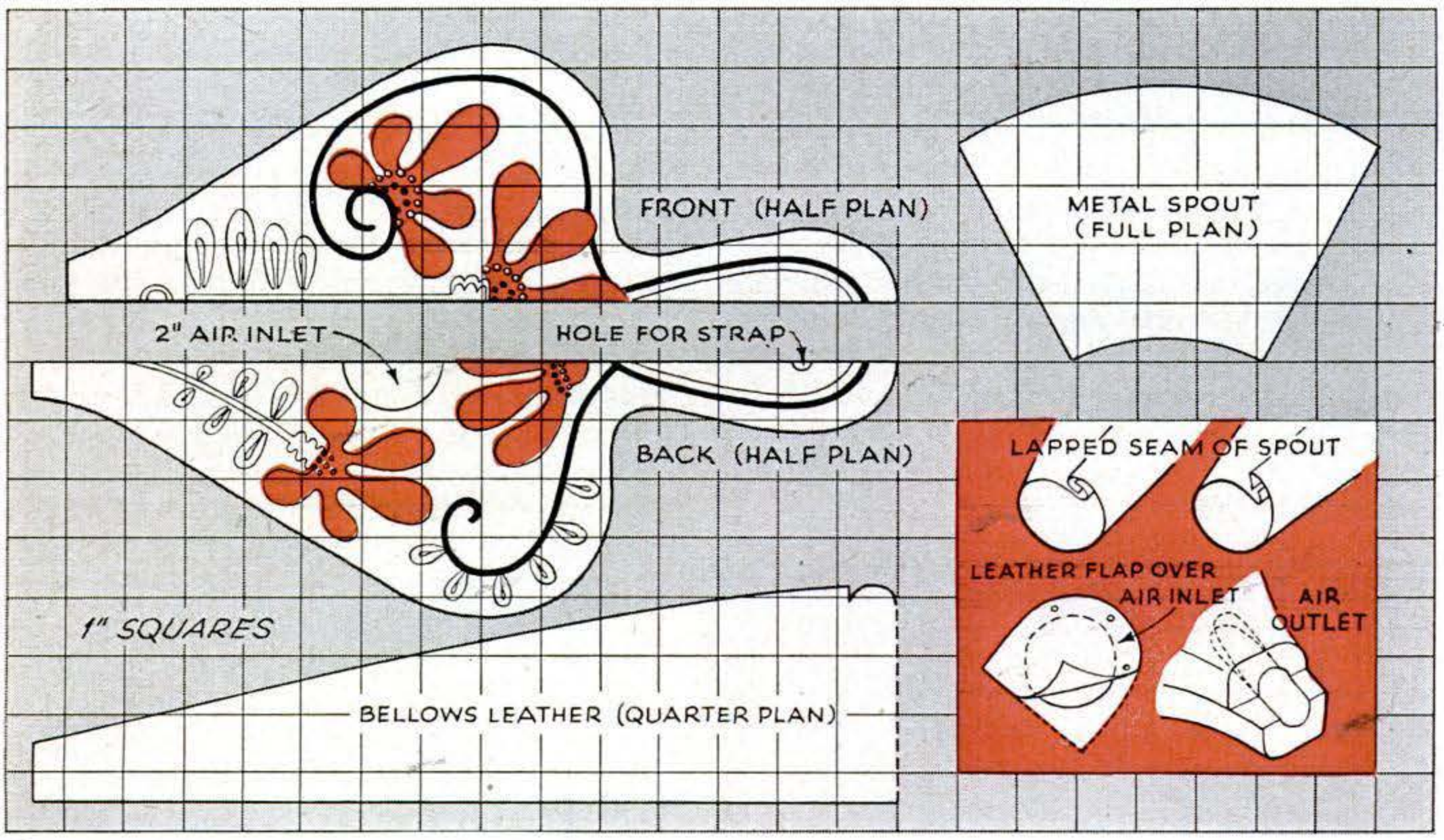
FIREPLACE bellows can be as handsome as they are useful. Here's one that proves it.

Begin by collecting the materials:

- Two pieces of hardwood, approximately 1″ by 9″ by 15″.
- A strip of upholstery-weight leather—imitation leather will serve—about 7″ wide and 30″ long, plus a couple of smaller scraps for the flap over the intake hole and a collar around the spout.
- A 6′ roll of ½″ copper strip.
- Four dozen decorative upholstery tacks and a box of smaller tacks or screws.
- A 5″ by 7″ piece of sheet metal for the spout.

Draw the outlines full size and transfer them to the wood. Note that the back piece is ⅝″ longer than the front and has a 2″ air-inlet hole and a smaller hole for a hanger strap.

Spout ends are rounded and a rough trough is gouged for an air inlet in the in-



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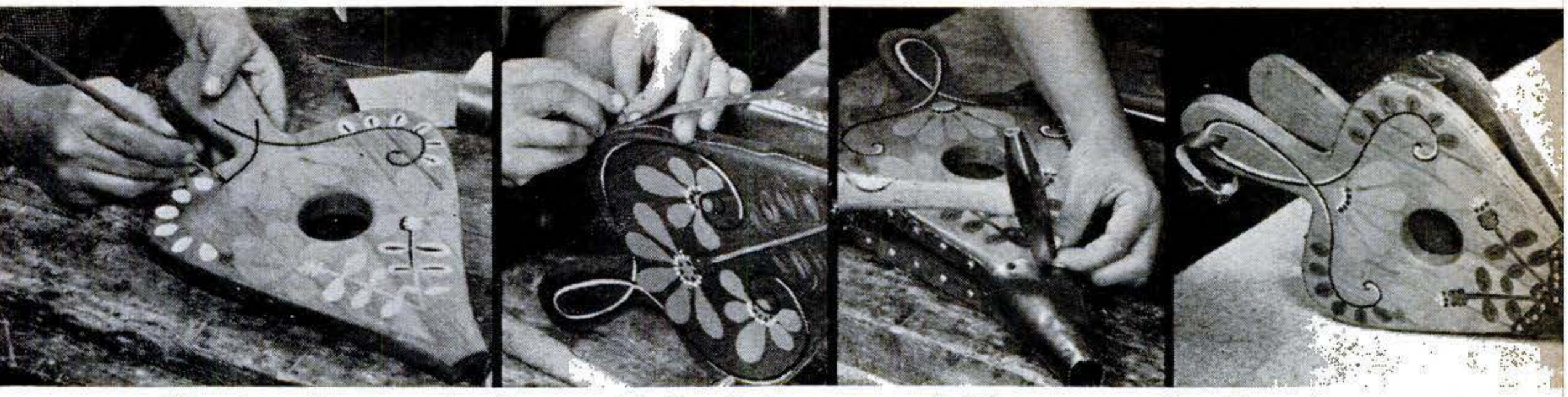


Wooden pieces can be decorated before being assembled. Here the wood was sealed with two coats of shellac and the design hand-painted on the natural grain. After the bellows leather was attached to the wood, the raw edges were concealed by copper strips. Then the spout was nailed to lower end of the back piece; the seam goes in back. Finished bellows, right, shows air-intake hole and the collar nailed over spout. The collar is nailed to both front and back.

side surfaces where the ends meet. A leather flap large enough to cover the air-intake hole is tacked over it inside at the top only.

Only one fourth of the leather pattern is shown. Enlarge the squared outline to full size. Fold a sheet of tracing paper once and lay it on the pattern with the fold coinciding with the long, straight line. Trace the pattern, unfold the sheet, and trace the other half, matching the pattern symmetrically. This will give you the half pattern. Flop it over on the leather to complete the outline.

Tack the leather around the wood and cover the raw edges of the leather with ½" copper strips and decorative upholstery tacks.

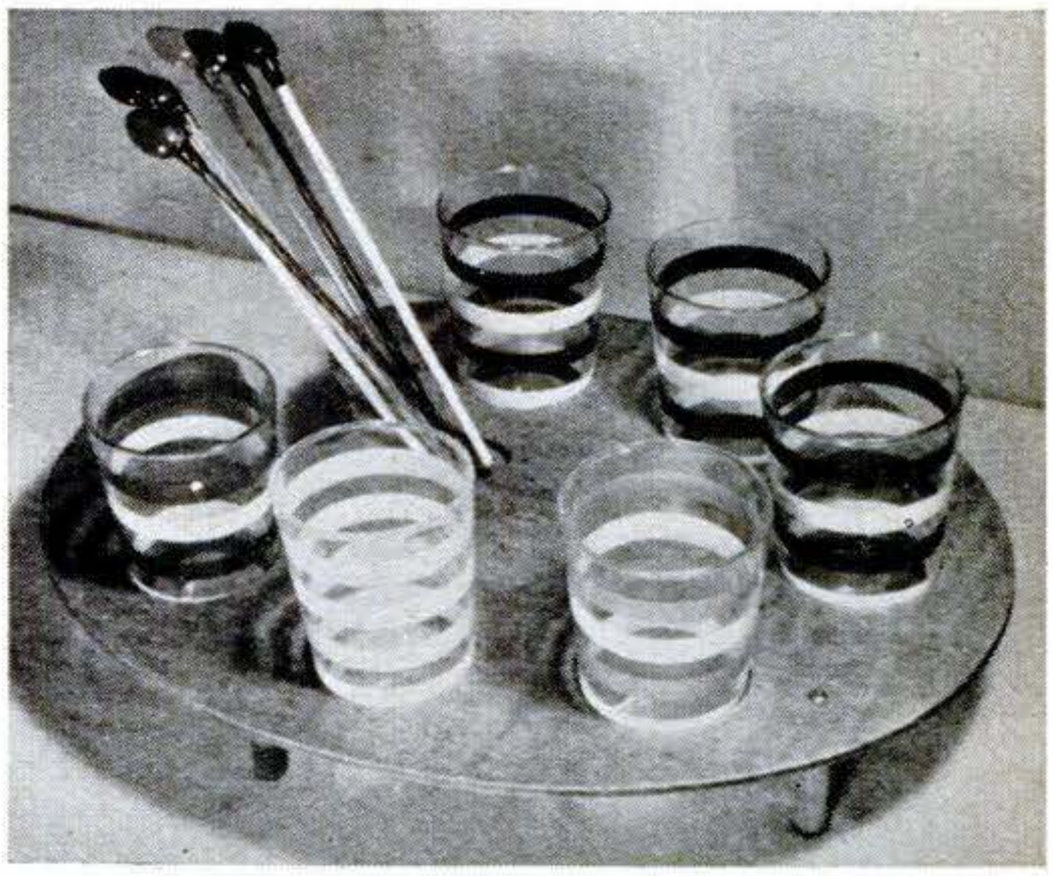
Shape the spout to the rounded end of the bellows. Form and solder the lap seam, and nail the spout to the back piece only. The front is held by the leather collar.—*Doris Aller, San Francisco.*

Your Host Can Display His Art On This Palette Tray

THE person who receives the tray pictured here won't have to worry about spilling the drinks when he serves refreshments. If you're invited out for Christmas dinner, why not make such a tray to take along as a gift for your host?

A 10" by 14" palette bought at an artists' supply store is the chief material. You add color by inserting glasses of different hues. Cut holes that will let the glasses sink about 1½".

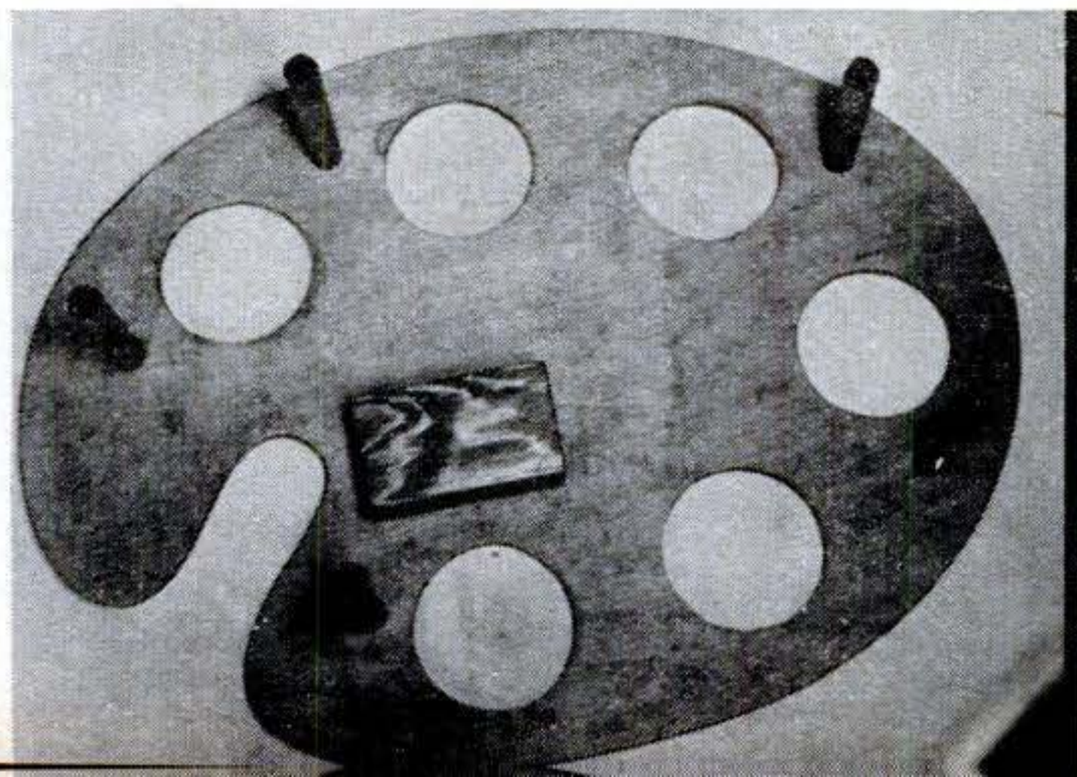
If your palette has a natural finish, you may want to use a light stain. In any case, you'll want to brush on two or three final coats of spar varnish to protect the wood.



Glasses can't slip or slide on this tray. The tumblers are secure until they're lifted out.

Legs are five ½" by 2½" dowel lengths. They're held by glue and screws driven from the top.

To hold stirrers, drill 3/16" blind holes in a wood block and nail it beneath the thumb hole.



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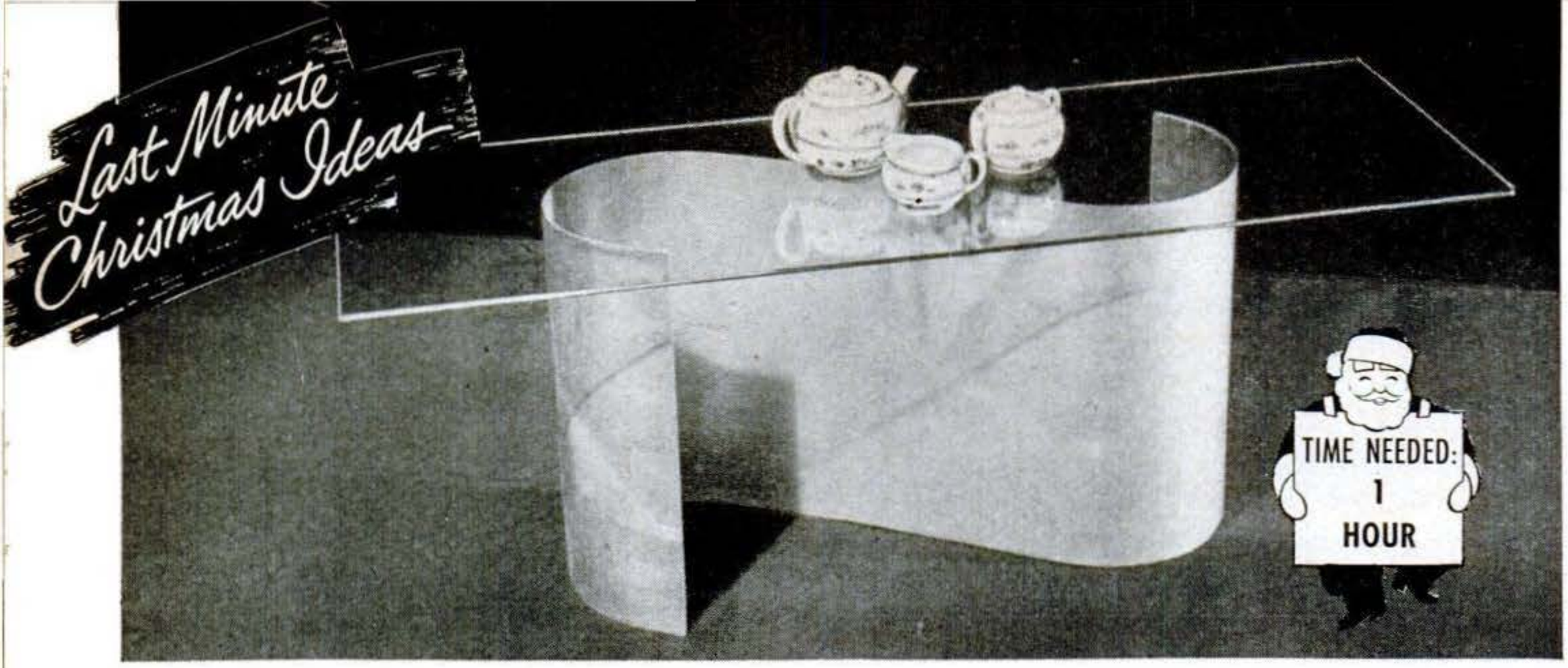


'Rolled Out' Coffee Table

YOUR friends will be proud to serve their Christmas callers on this modern table of aluminum and glass. It's really swanky looking. You can whip it up as a handsome gift in practically no time at all and with no tools—other than your hands.

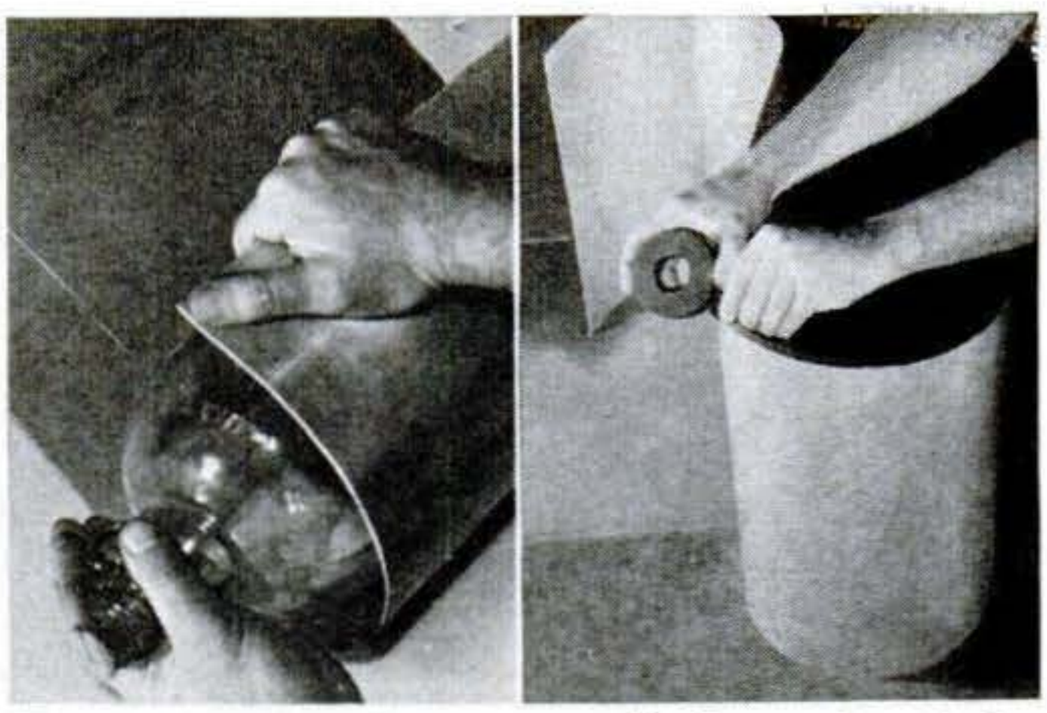
Here's what you'll need:

Sheet aluminum, 17″ by 48″, 20 gauge, No. 3S half-hard.

Shatterproof auto glass, 16″ by 48″.

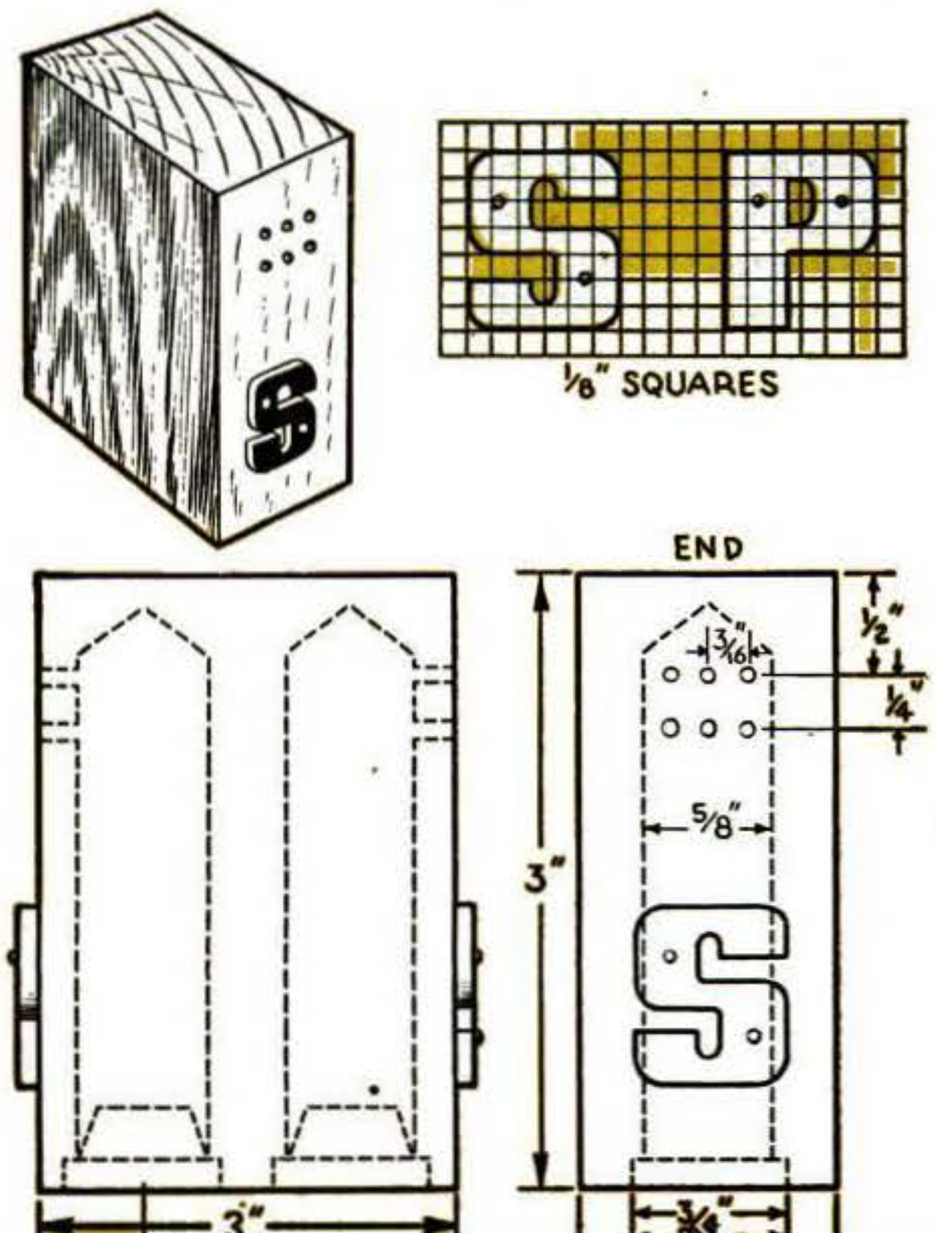
Roll of friction tape.

Have the glass and aluminum cut to size when you buy them. Curve the metal panel around a gallon jug so you get a graceful S shape. If the glass tends to slip on the aluminum edge, bind the top edge of the metal with black friction tape. This binding makes the glass surprisingly resistant to shifting. Of course, you can alter the dimensions to suit yourself.—*G. Daniels, Glenville, Conn.*



To make the S curve, roll the ends of the aluminum around a gallon jug. They'll hold their shape. Black friction tape bound on the top edge will stop the glass from slipping.

Maple Boxes Will Help Adorn Holiday Dinner Tables



SEASON your season's greetings with these simple salt and pepper boxes. Dressed up with walnut or mahogany letters, they're handsome and useful gifts.

Saw the block to size as indicated in the drawing. Bore two ¾″ holes about ¼″ deep for the corks to fit in. Then, with a ⅝″ drill, continue the holes to within ¼″ of the top. Sand all surfaces and apply maple stain. When it's dry, brush on clear lacquer. Use a 1/16″ drill for the pepper side and a 3/32″ one for the salt. Jigsaw the letters from ⅛″ stock and drill holes for small roundhead brass nails to attach the letters.

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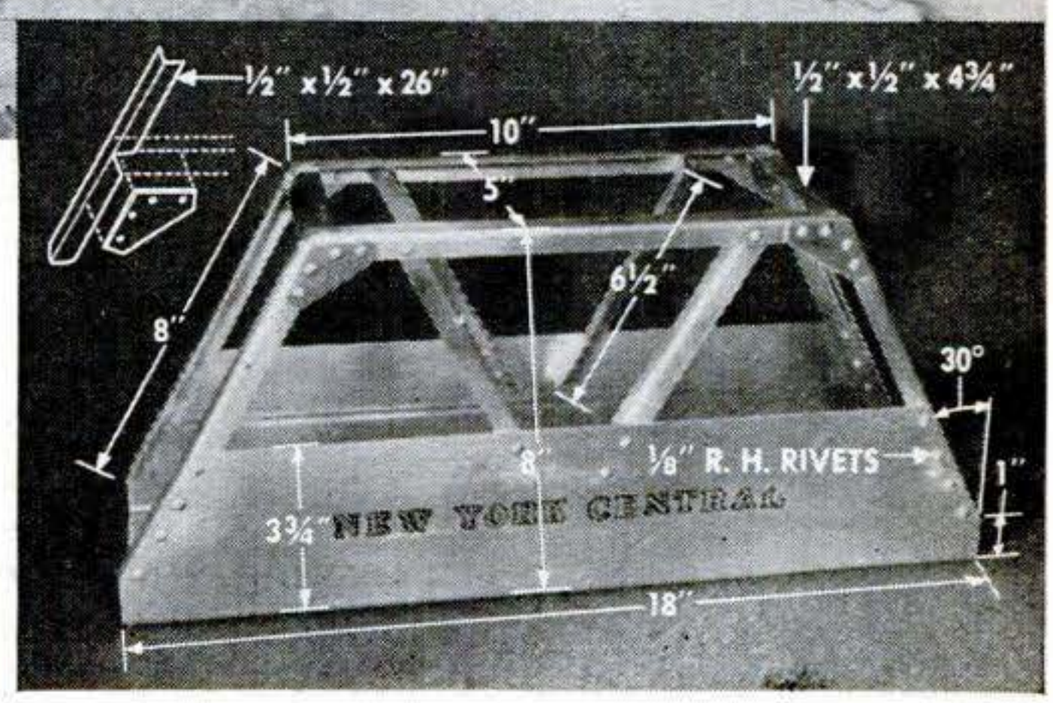
Bridge Adds to the Fun Of Running a Railroad



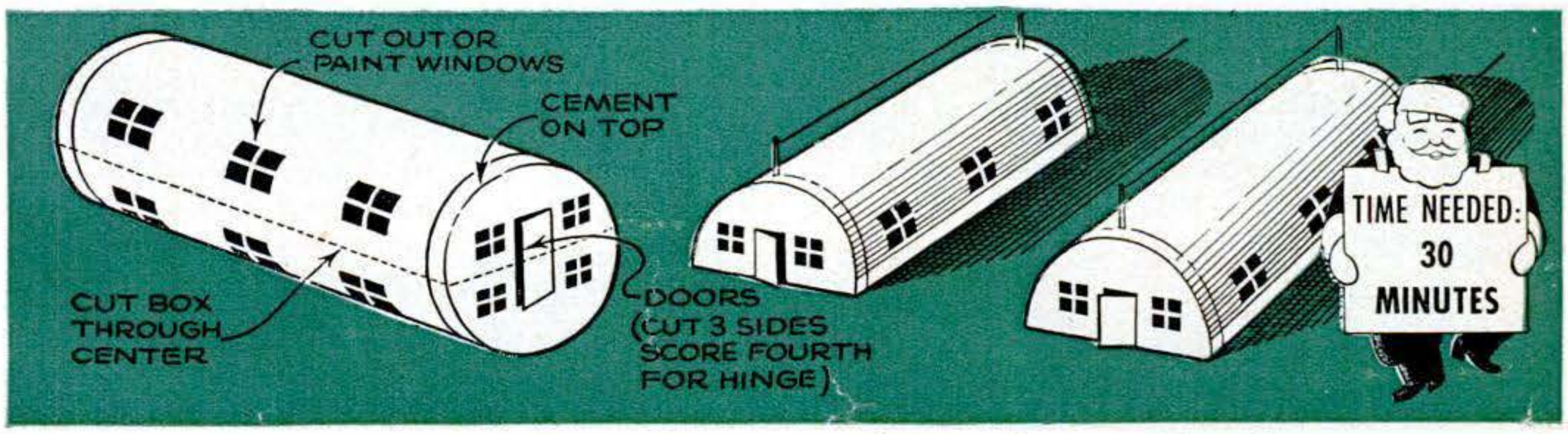
WHEN your junior engineer takes his streamliner out for its first run Christmas morning, he'll get a bigger bang out of it if he can send the train flashing across an eye-catching and rugged bridge. Here's an aluminum one you can build for him.

The main member is a channel bent up from a 12½" by 18" sheet of .040" aluminum. Two 26" lengths of ½" angle stock form the chief supports of the upper structure. These are notched and bent to form the angles between the longitudinal section and the slanting ends.

Preformed angle stock is the easiest to use, but if you don't have any you can make your own from flat sheet. Cut strips just under 1" wide, clamp them lengthwise between two boards, and bend over evenly.

The two uprights are fastened to the base with roundhead bolts or rivets. You'll find it simple to clinch rivets if you first assemble the pieces with screws, then remove one screw at a time and replace it with a rivet. With the uprights in place, the gussets at the corners, the two spreaders, and the four diagonals (also angle stock) can be cut and fitted right on the job. In drilling the rivet holes, drill through both pieces at once to make sure the holes line up.—*R. J. Christoforo, The Bronx, N. Y.*

Oatmeal Boxes Can Be Turned Into Quonsets for Toys



As A separate plaything—a toy garage—or as a bit of dressing to liven up a model town, this pint-sized Quonset hut fits in perfectly.

One oatmeal box or other tubular carton makes two houses. Glue the top on securely, and paint or cut out windows and doors. Slit the box lengthwise. Paint the huts gray and add toothpick-and-thread aerials.

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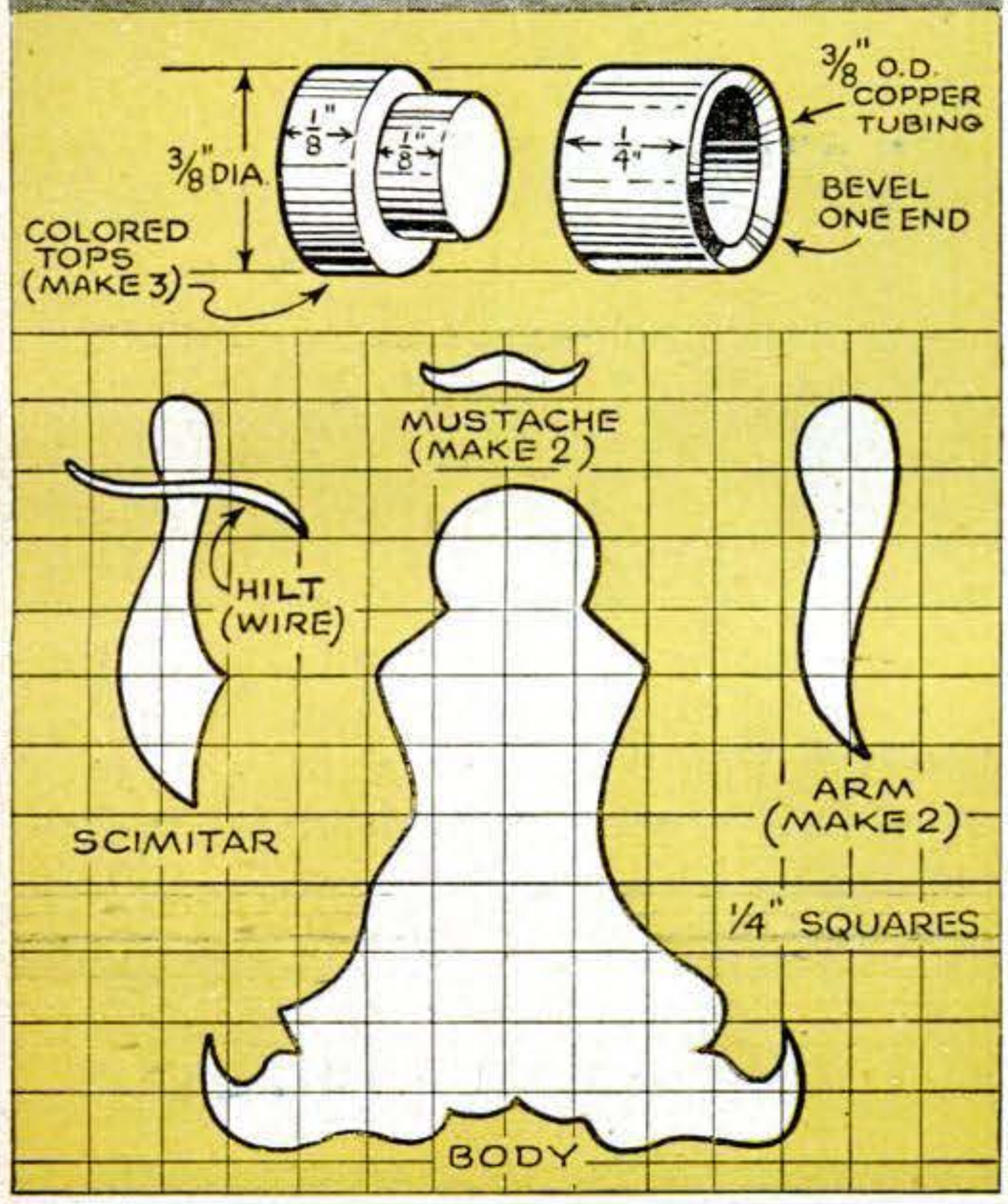
Last Minute Christmas Ideas



Copper Makes Pin and Earrings

THE savage-looking Caliph at the left was said to have a way with a woman. Though he seems fierce in this modern form, he can still speak softly for you on Christmas day.

Clean a sheet of 20-gauge sheet copper with kitchen cleanser and scribe the squared patterns. Saw out the blanks, leaving about 1/32" allowance around the head and neck.

Hammer the blanks flat on a smooth steel block, and file down to the scribed lines everywhere except around the head. Snip or saw out two 17/32" disks from 20-gauge copper to make the flat backs for the earrings.

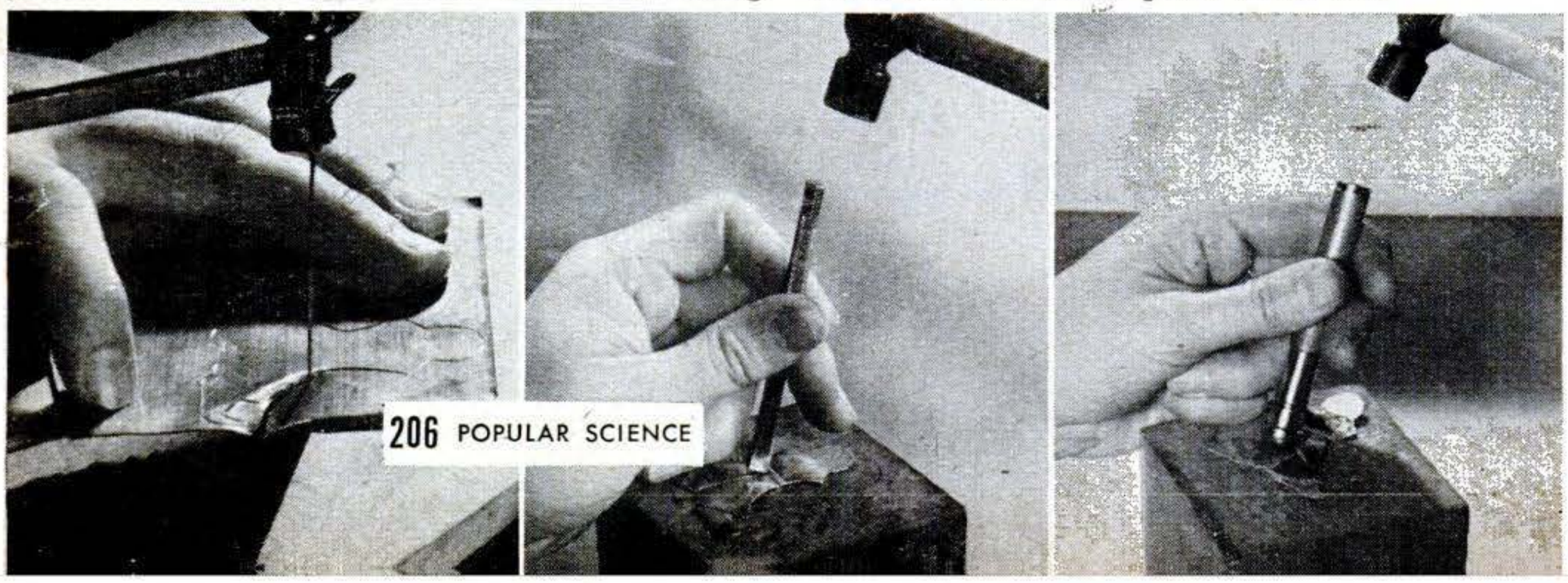
To make the domes, anneal a ¾" by 3" strip of 26- or 28-gauge copper by heating it to cherry red, and then plunging it into a pickle bath. (This can be made by carefully adding one part of sulfuric acid to 8 parts of water.) Form the domes with a ½" ball-tipped punch used over a depression in a lead or hardwood block.

The next step is to give form to the cutout blanks. With a sharp point or tracing tool, outline the belt, trousers, legs, and so on. Turn the blank over on the anvil and raise the metal between the lines with the ball punch.

Copper work-hardens quickly, so you may have to do each of these jobs in stages, annealing the metal two or three times.

Buff the pieces and dip them in the pickle solution again to prepare for soldering. Bend

Scribe the outlines on sheet copper. Cut a V notch in a board (below), clamp the board to the bench, and saw the outline with a fine jeweler's saw (left). With a "liner" or tracing tool, hammer the separating lines on the face side (center). A ball-tipped punch, right, is used to raise chest, leg, and arm portions. Work from the back and push them out.



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the hand portion of the right arm in a forward loop to take the scimitar handle. Use a file or rasp to break up your silver solder into small granules. Apply solder and flux paste to the meeting parts with a toothpick. Carefully place each part in position, bending the parts where necessary to make the joints tight. Beginning with the scimitar, heat the metal with a torch. As the solder runs, press the parts tight together with the tang end of a file. When the work has cooled, scrub off the flux, dress the edges smooth with a file, and buff the complete unit. A coat of clear lacquer will retard tarnishing.

For each fez, cut a ¼″ length of ⅜″ copper tubing. Bevel one end of each tube to fit flush on the dome.

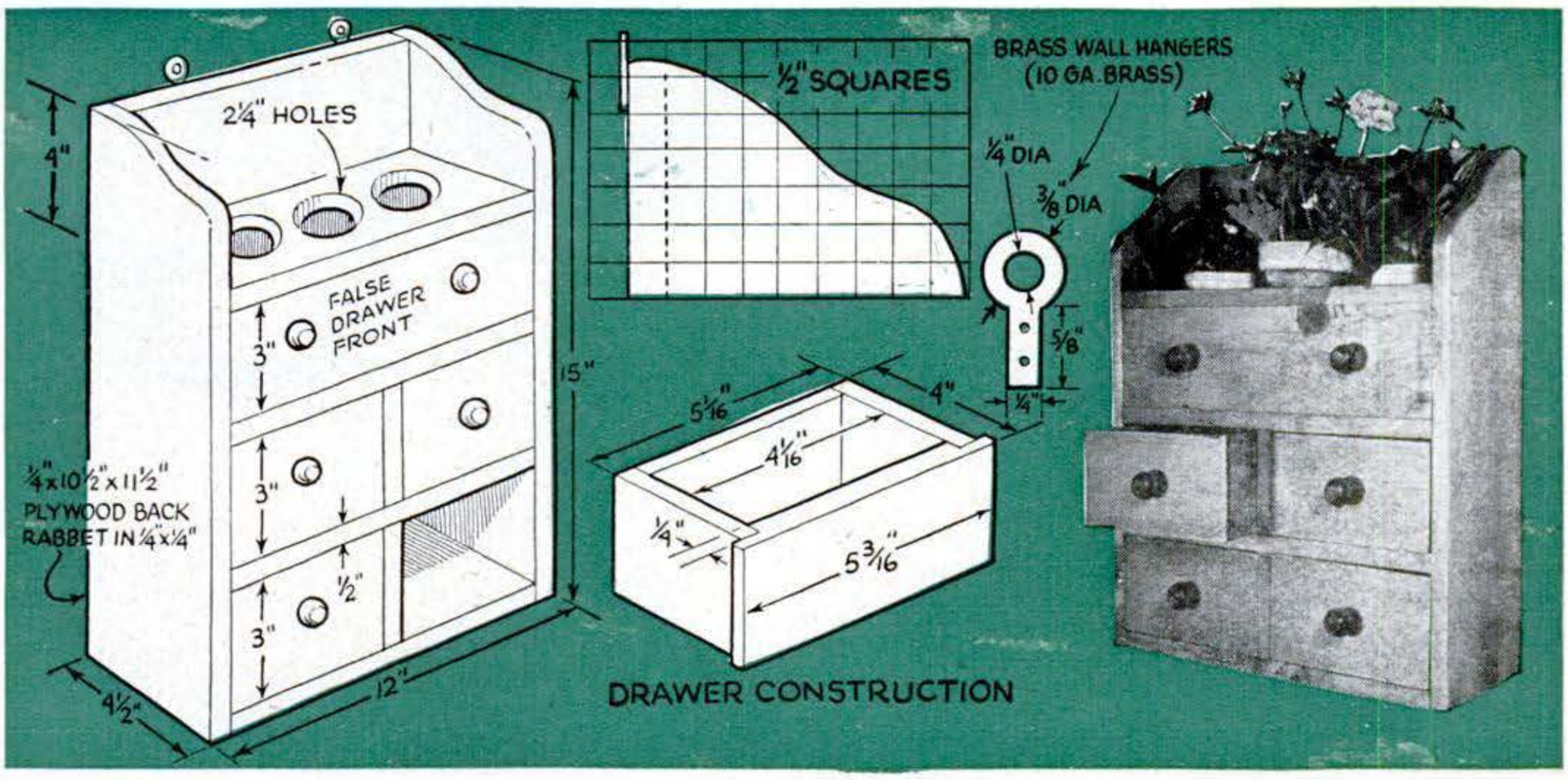
The earring clips must be soldered so that the heads will come out upright when worn. Remember to orient them so that there is one left and one right earring.

Colored tops for the headpieces are bits of plastic, turned in a lathe, buffed, and fastened in with cellulose cement.

A bent-wire support holds the fez in position as it is soldered. Use a minimum of silver solder to simplify later filing and cleaning.

With a little gift wrapping, the jewelry is then ready to go under the tree.—*Bill Luther, Los Angeles.*

If She Likes Flowers, She'll Like This Wall Chest



FOR the home decorator who would like to add a bit of spice to a planter cabinet, here is a handsome piece of early Americana. Four spacious drawers hold a generous assortment of canned spices while the potted ivy that flowers from the top lends a touch of freshness to the home.

The cabinet shown was made from knotty pine, though any ½″ stock will do. When cutting the wood, try to get a few knots in the drawer fronts. Cabinet and upper false-drawer front are cut to size and assembled with glue and brads. The three flowerpot holes are made 2¼″ wide to take standard 2″ pots.

Assemble and fit the four drawers, sand all parts smooth, and round the corners slightly. Cut two wall hangers from sheet brass.

To make it look like an old piece, you may want to leave a few marks or scars near corners or drawer edges. Apply a thin coat of maple stain and wipe it off before it's thoroughly dry. Two coats of orange shellac give the planter chest an appropriate finish. —*Whitney K. Towers, Los Angeles.*

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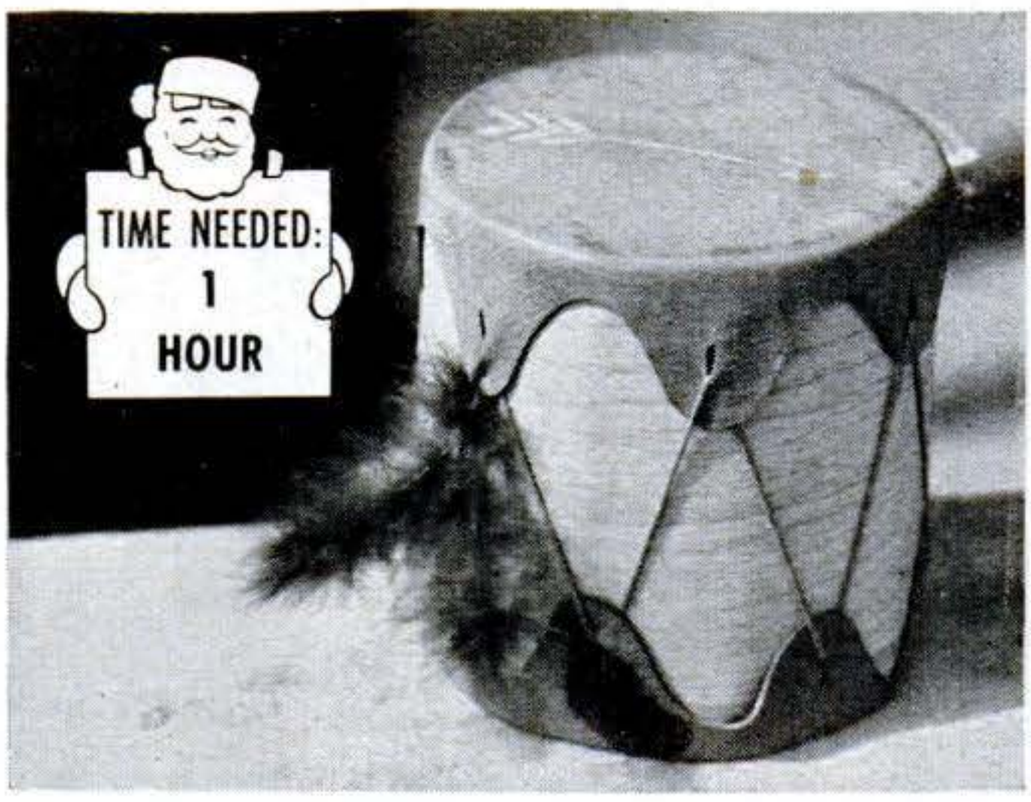
Here's a New Way to Make Sparkling Christmas Tags

THESE luminous-plastic Christmas tags don't shine in the dark, but their legend, decoration, and edges do glow softly if there's any light in the room. Cut them from 1/16″-thick acrylic of the type that fluoresces under external light. Place the piece over your pattern and trace on the design with a vibrating-type engraving tool. The pencil-type tool shown, an Electro-Stylus®, permits exact, delicate work.

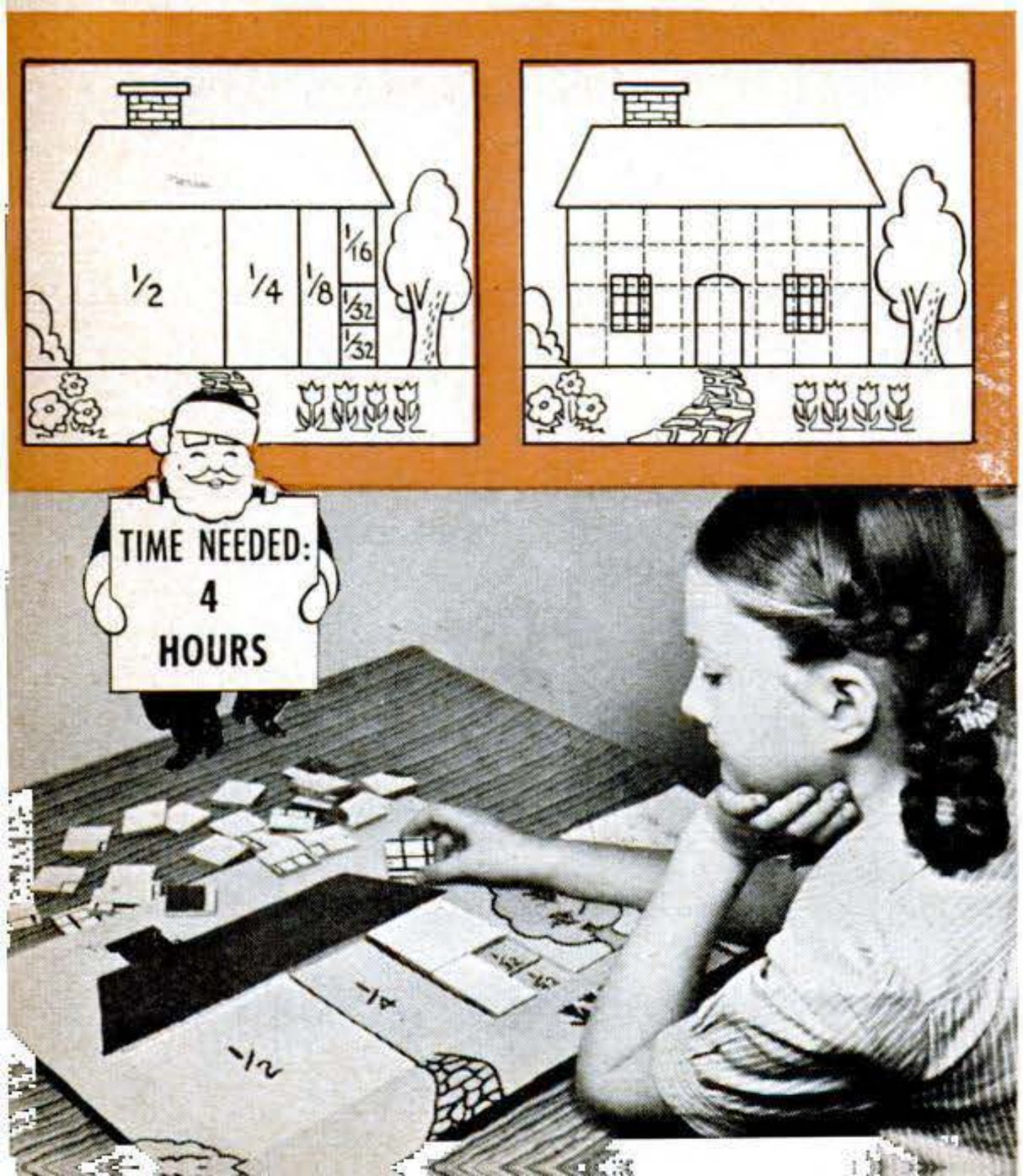
Turn a Coffee Can Into a Drum

PERHAPS your boy or one of his friends is getting an Indian suit for Christmas. Here's a war drum that'll make playing Indian more fun. Cut both ends out of a 2-lb. coffee can and glue tan or brown blotting paper around it. Cut out two pieces of inner-tube rubber as shown, stretch them over the ends, and lace them tightly with rawhide thongs.

As an additional touch, dye a few feathers in brown colors and attach them to one of the thongs. Paint on the figures.



A House Built of Fractions Makes Arithmetic Fun



"WHY isn't one-eighth larger than one-fourth?"

If the small fry are throwing questions like that at you, here's the answer—all wrapped up as a useful gift.

Two 15″ by 18″ plywood pieces are needed. The 6″ by 12″ house is cut out of one piece of plywood and then sawed into 32 blocks, each 1½″ square. The cut-out board is then glued and screwed to the other piece of plywood, forming a frame. The blocks—with windows and a door painted on them—fit into the frame like a jigsaw puzzle. The space where the blocks go is marked off into the different fractions as shown at left, and each fraction space is painted a different color.

Paint the roof, walk, tree, and flowers.—*Elma Waltner, Hurley, S. Dak.*

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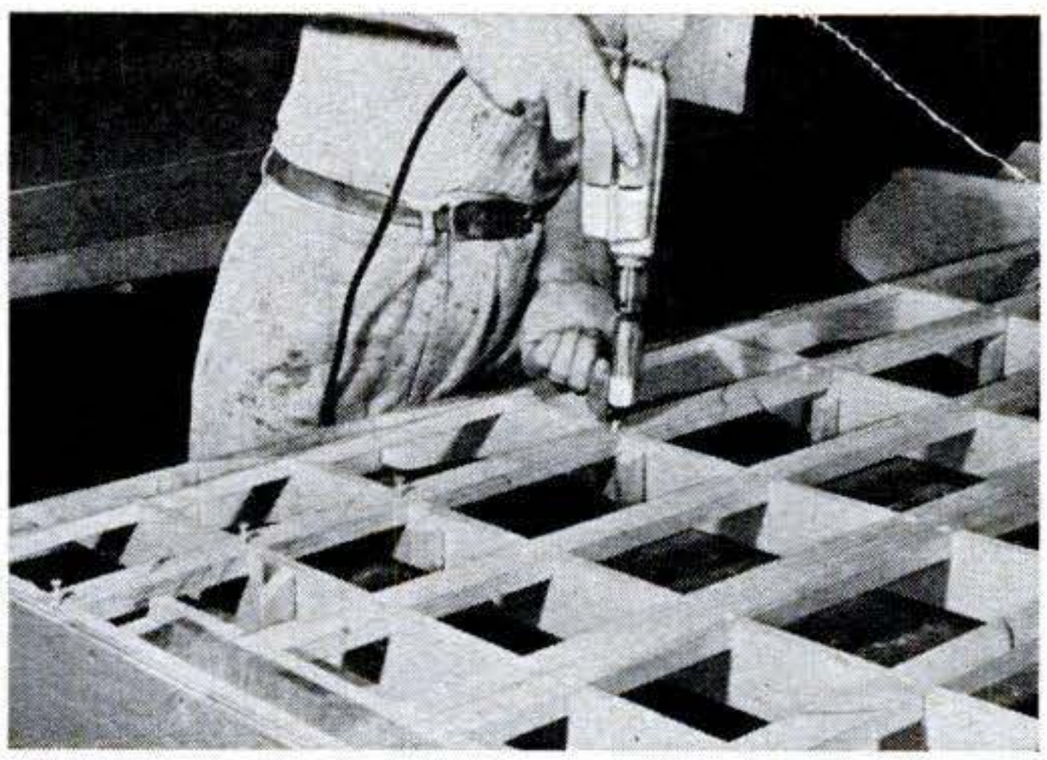
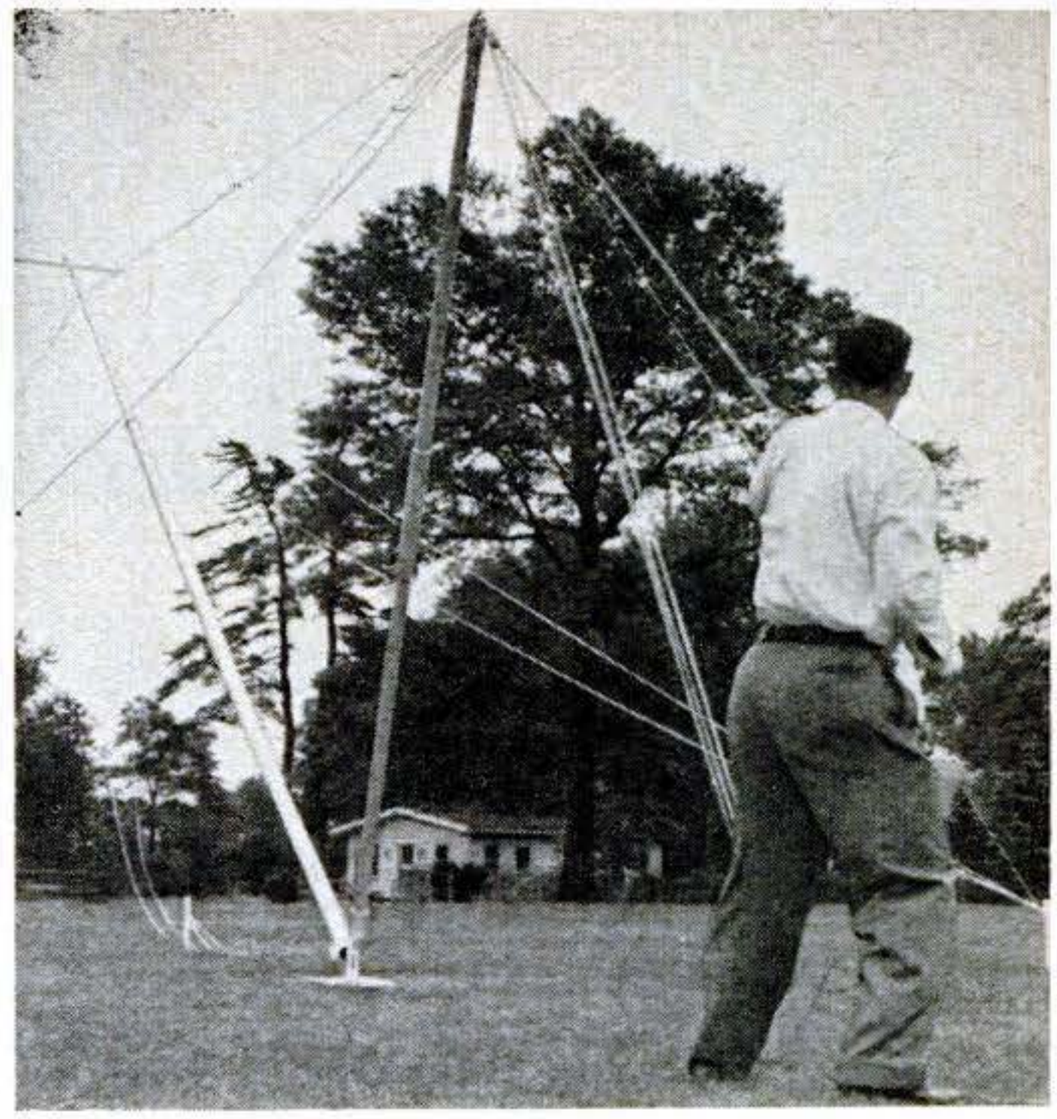
Clip-On Lamp Does Many Jobs

THIS flyweight lamp—it weighs only 5½ oz. —will clip on the edge of a book when you want to read in bed. Or, you can clip it under a car or in various spots on the engine as an aid in making repairs. It is 4 in. high and comes in three finishes—copper, brass, and aluminum. The aluminum is recommended for utility use. Moviette, Inc., of New York City, prices the lamp at about $3. It plugs into any standard wall socket.



Drill Powers Screwdriver

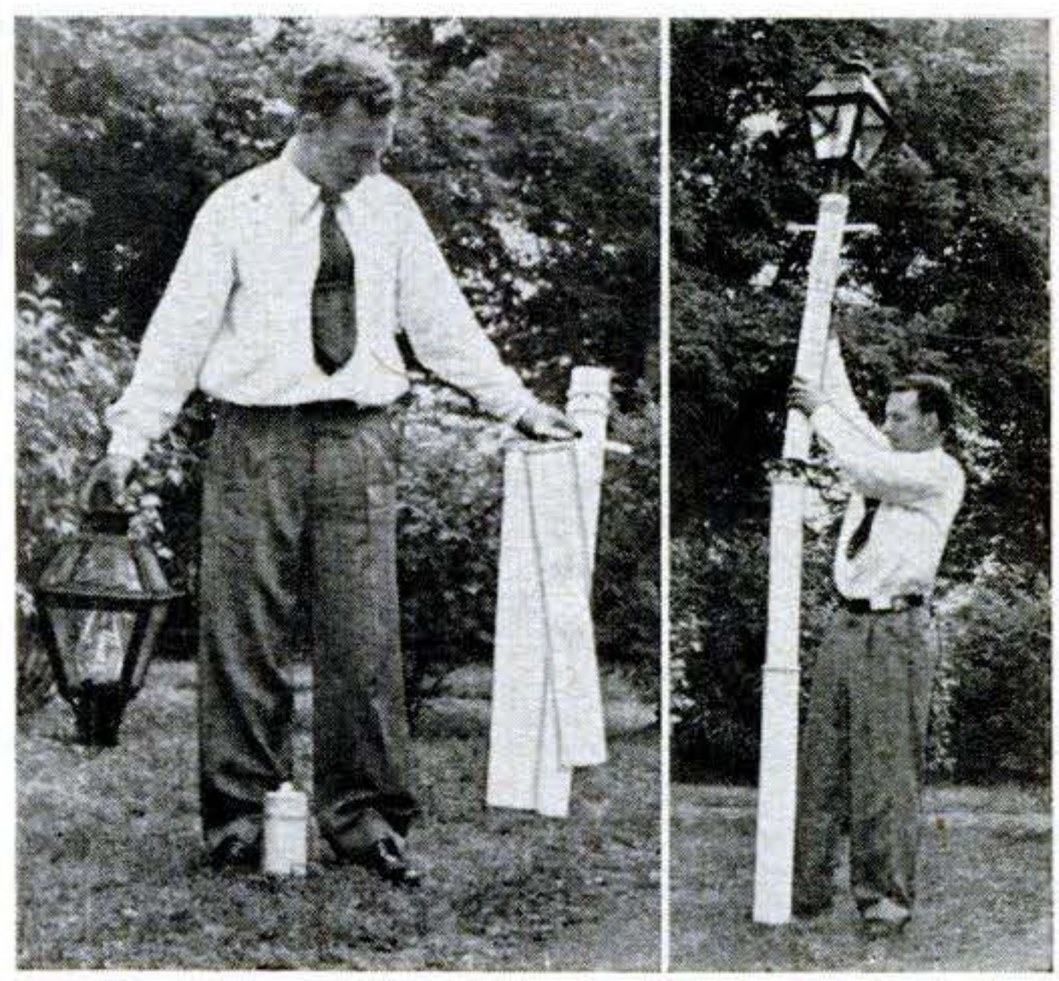
You can drive screws with any electric drill or drill press with this new Bull Driver®. Chucked in the drill, the tool automatically centers on the screw, drives it, and then automatically disengages when the screw has been driven home. A sleeve on the tool encircles the head to hold it in position and center the blade. Bertram Engineering Co., Kansas City, Mo., prices it at about $5. It's available for standard and Phillips screws.



Tubes Made of Plywood

FLAGPOLES, lampposts, jury masts for small craft, and masts for TV antennas are a few of the many uses for Woundwood®, a plywood tubing. The lightness of the material makes it especially easy to handle. In the photo above, one man is raising an assembled TV mast. The photos below show a decorative lamppost being put together.

Woundwood products are distributed in kits by the Special Purpose Products Co., of New York City. The 7-ft. lamppost kit (lamp not included) consists of three sections and a creosote-treated base. With the base planted several feet in the ground, the bottom section is set over it. Each additional section, with an end of slightly smaller diameter, nests tightly in the top of the preceding section. The wiring runs down through the hollow core and is protected by it.



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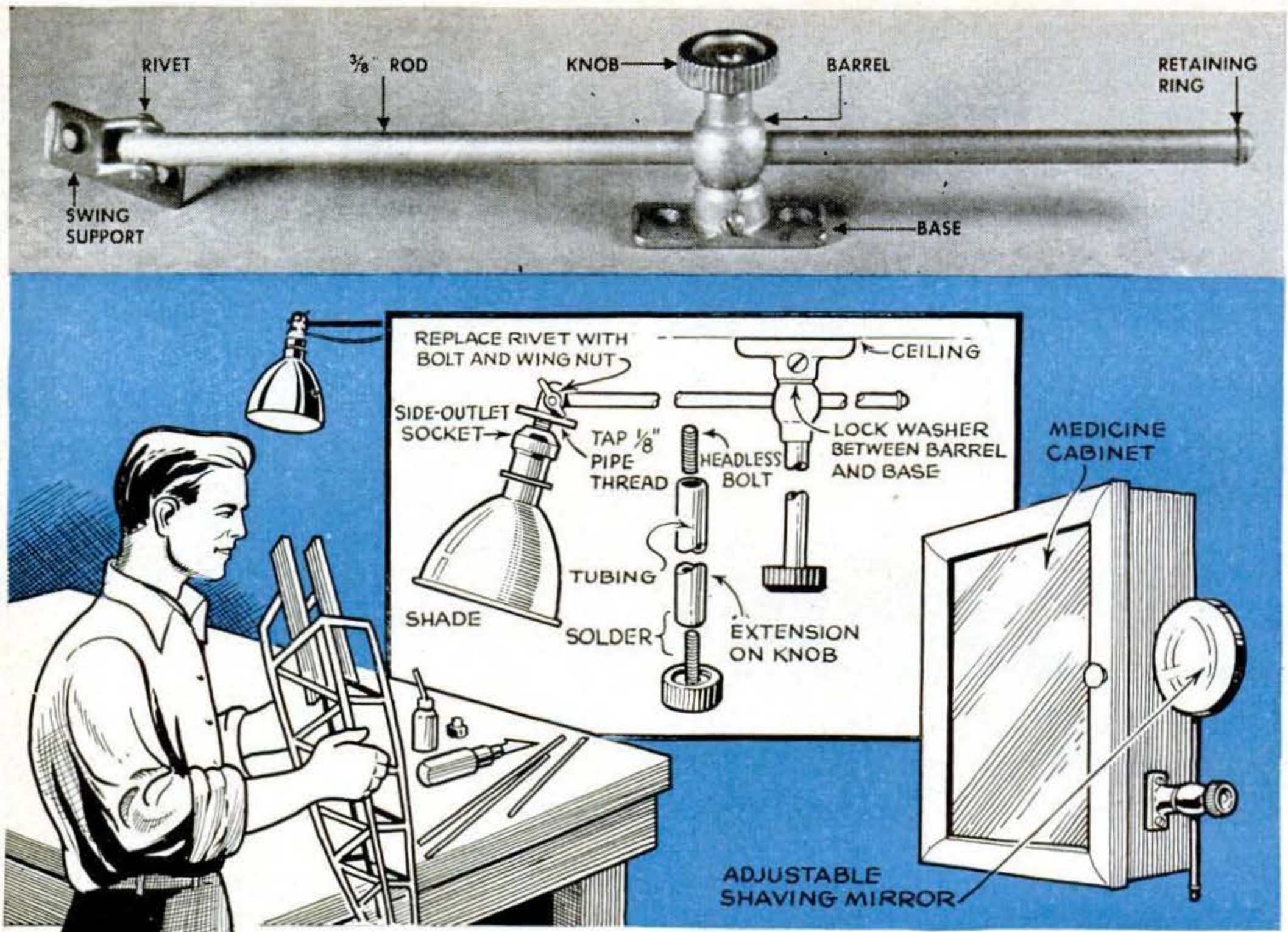
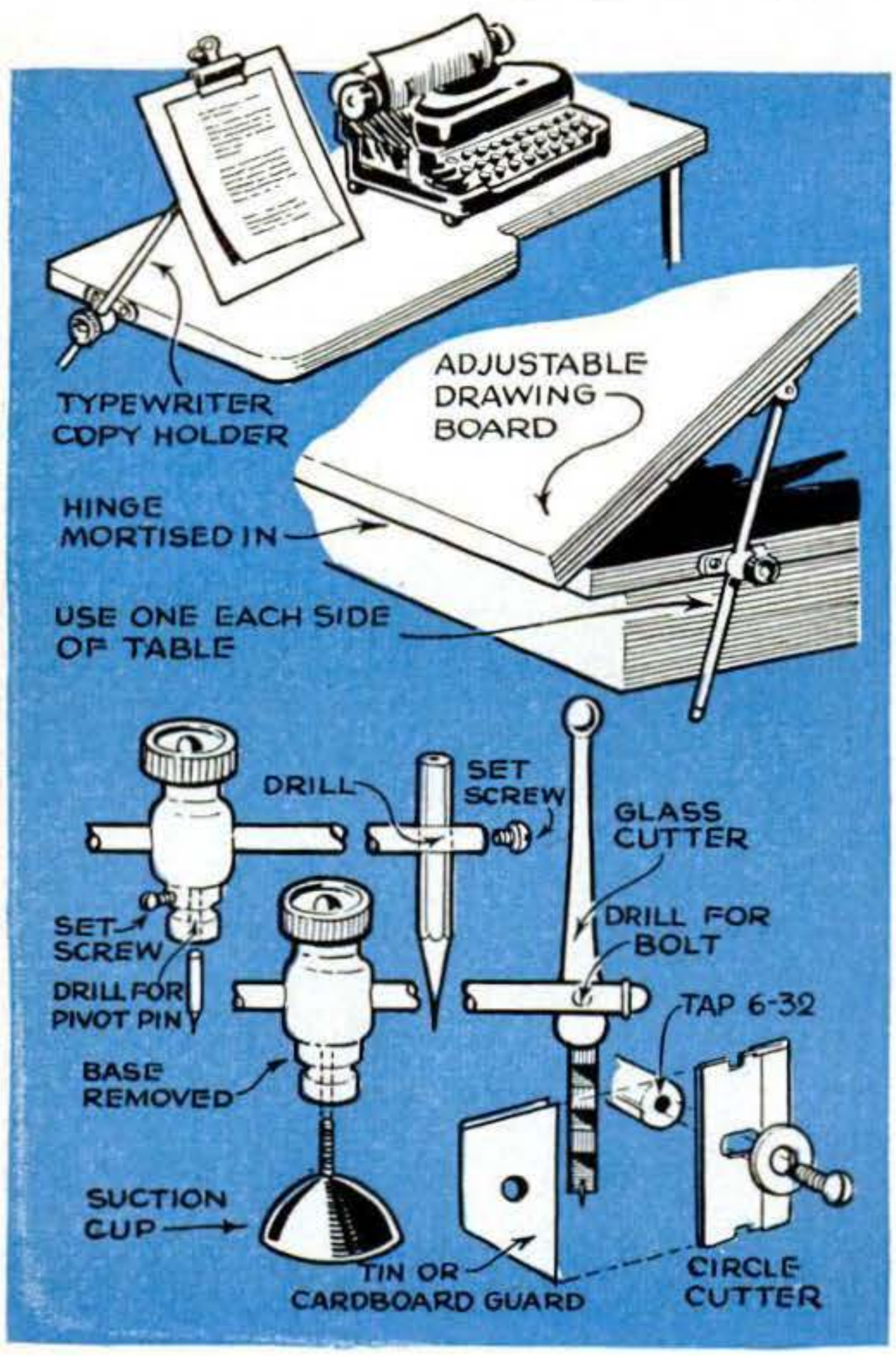


Use a Sash Adjuster



WHAT can you do with a casement-type sash adjuster? Just adjust sashes? Not at all. That's only the beginning. It would be fairer to ask: *What can't you do?*

On this page, you'll find a few of the many unexpected uses for this piece of inexpensive hardware. And here are some others you may want to try: a radius guide for a bandsaw or jigsaw; a "third hand" for soldering and brazing operations; and an adjustable holder for photo reflectors, magnifiers, and close, delicate work.

A variety of movements and adjustments are possible. The adjuster consists of a rod that slides in a barrel pivoted on a small rectangular base. The knob on the barrel clamps the rod when tightened. On one end the rod carries a plate that's free to swing.

For some applications, friction must be applied to the swiveling barrel so it'll stay put. (The setscrew on the base merely keeps it from pulling out.) A cupped or spring washer, or just a lock washer, will do this. You may have to file a bit off the top of the socket on the base to accommodate the washer.—*John P. Arnold, Doylestown, Pa.*

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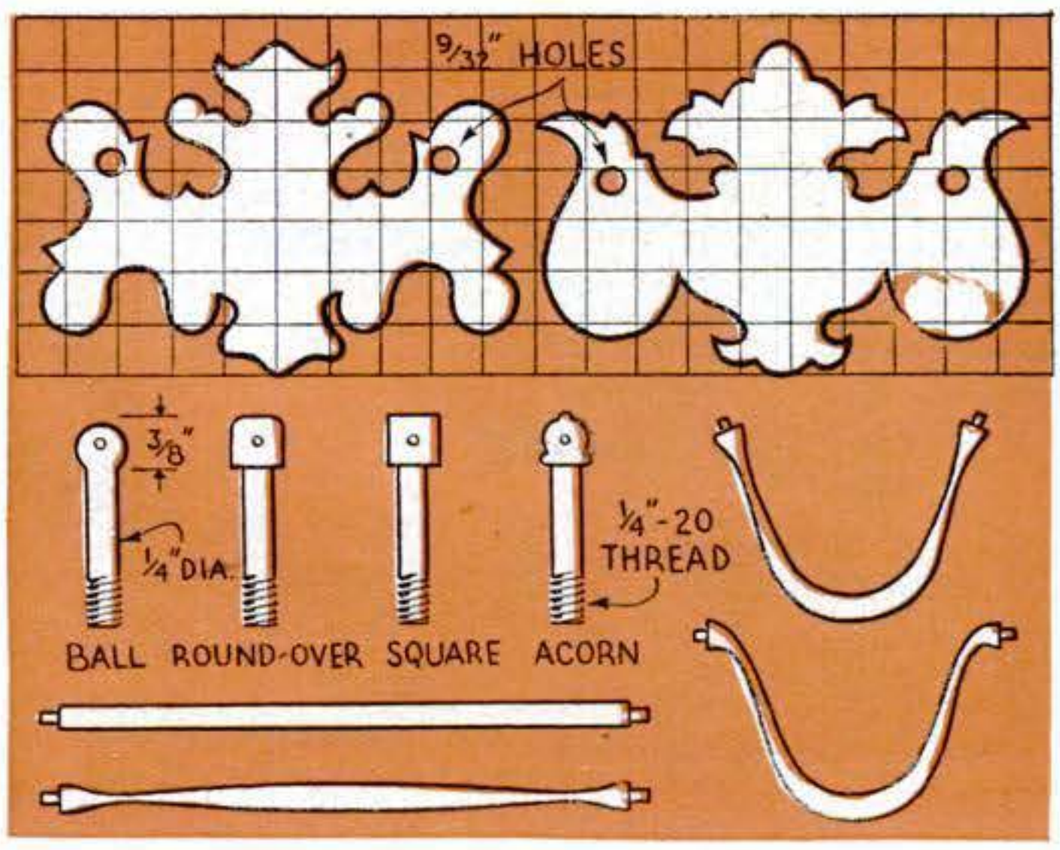
Reproductions of Colonial craftsmen's designs will increase the value of your work.

Chippendale highboy in Metropolitan Museum of Art is fine example of early American furniture dressed up with brass handles.

You Can Make Brass Handles for Furniture

BRASS pulls and escutcheons on the drawers of Colonial furniture invite you to open them—and are one reason that the secretaries, highboys, lowboys, chests, and dressing tables built by early American craftsmen are still highly prized.

If you have a jigsaw and a metal or wood lathe with a slide rest, you can make reproductions of such plates that'll greatly enhance the appearance and value of your work.



The materials you'll need are:

1/16" sheet brass.

3/8" brass rod for posts.

1/4" brass rod for handles.

If you can't get brass rods, use bronze welding rods. You can buy them at any welding shop. The plates can be cut from brass sheet thinner than 1/16", though a thinner gauge doesn't look as good.

First, redraw the plate design you want full size and trace it onto very thin, fine-grained hardwood. Then cut this out on the jigsaw and file and sand the edges until perfect. With this pattern, you can lay out the required number of plates on the brass with a soft-lead pencil. Give the designs a couple of coats of lacquer to protect the lines during the handling and cutting.

Sawing the Plates: This can be done entirely on a jigsaw, using heavier metal-cutting blades with the saw belted to its

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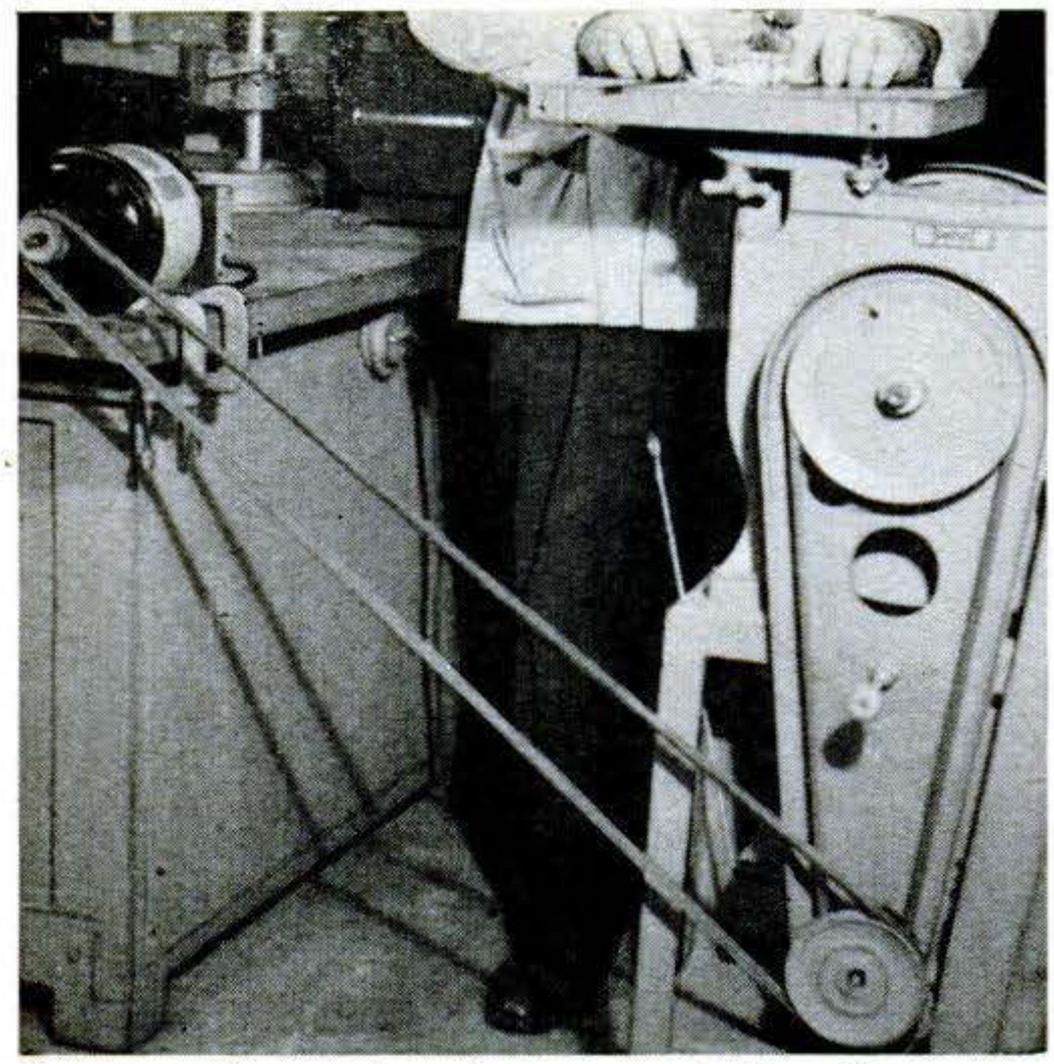
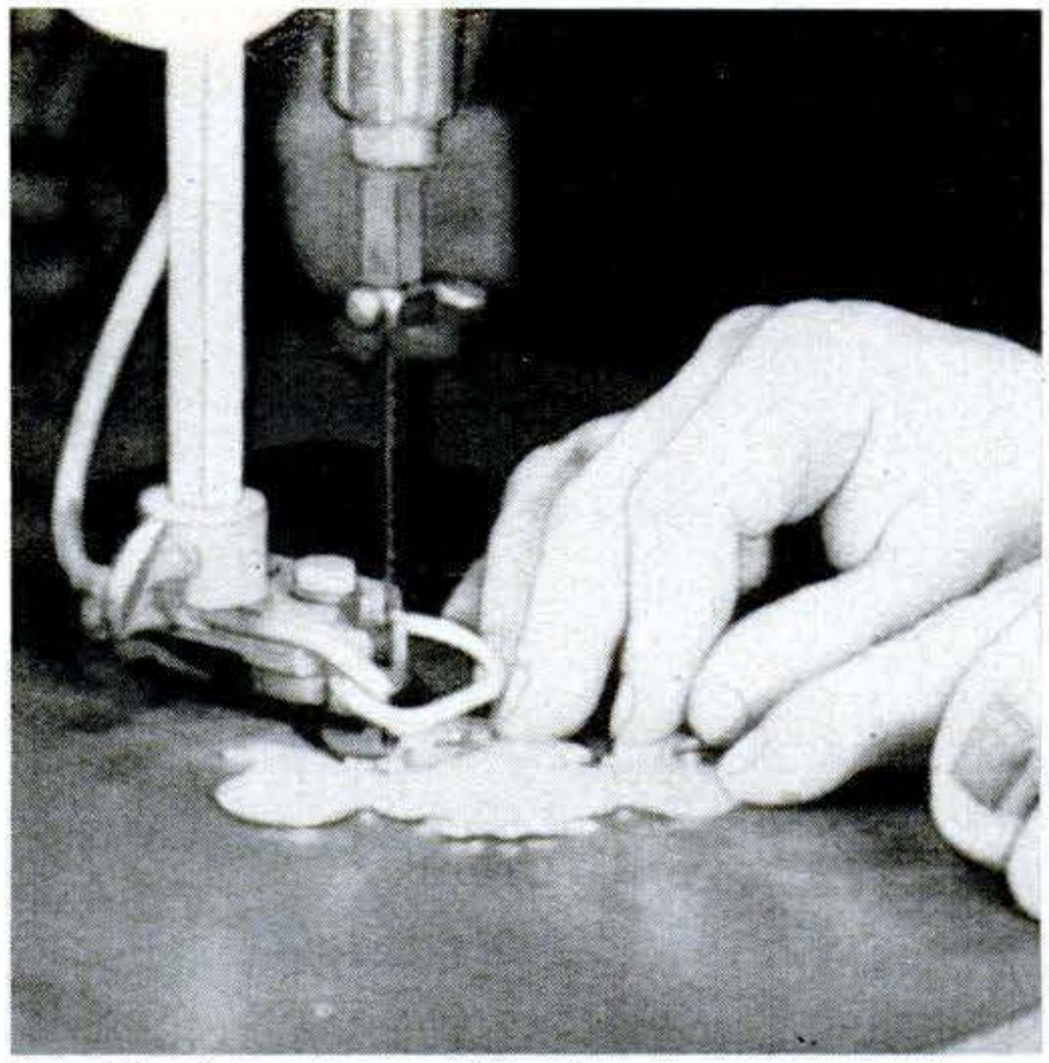


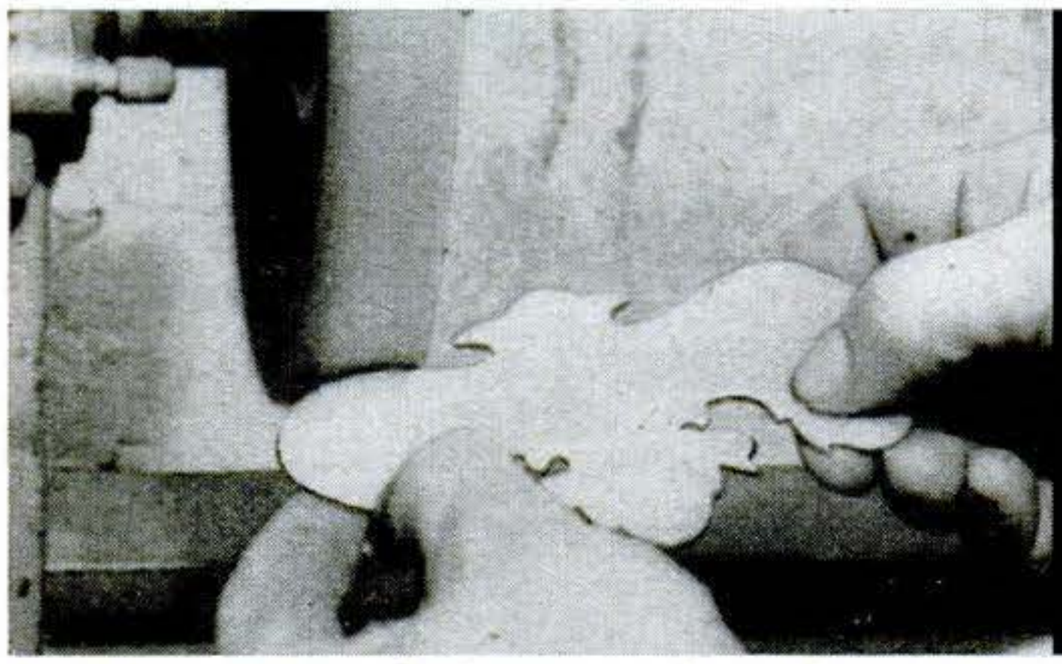
Setup to lower bandsaw speed. Regular motor is used as jackshaft for drive from second motor.



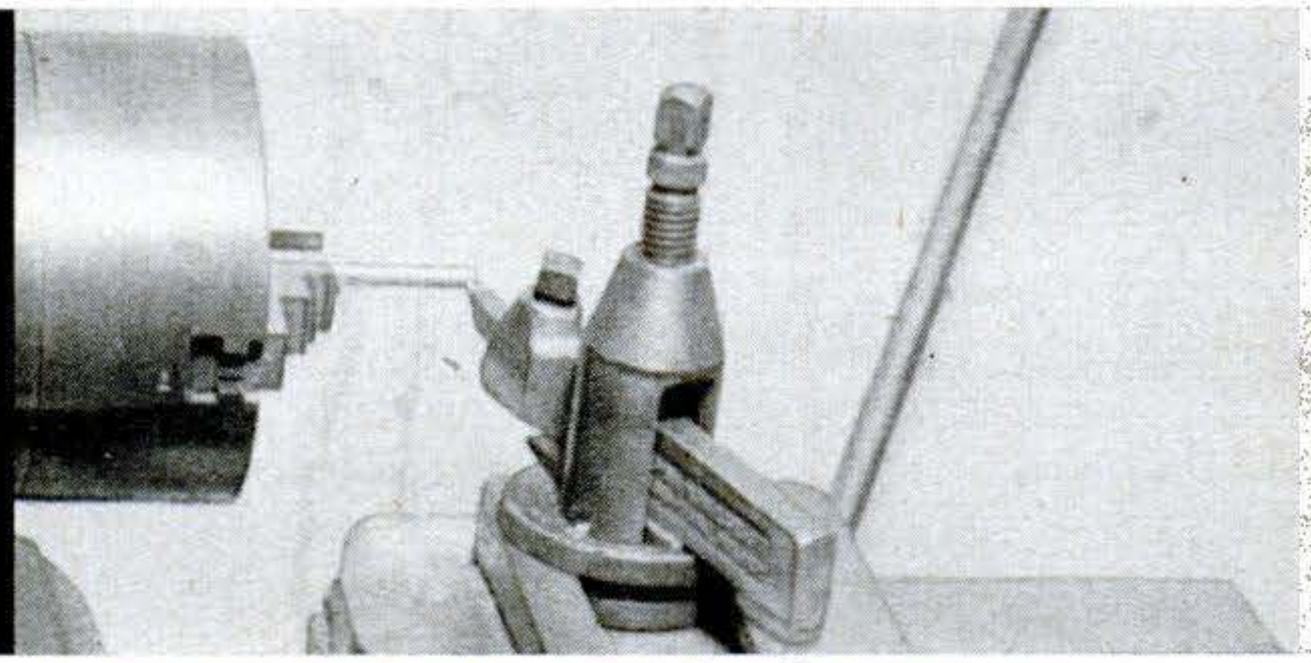
Small, short curves in plates are cut out on a jigsaw. Longer curves are cut on the bandsaw.

slowest speed. However, a 3/16″, 18- to 24-gauge metal-cutting blade on a bandsaw will do it faster. The bandsaw should be used only for cutting the long, easy curves. Leave the small, short curves for the jigsaw. To adapt a bandsaw for cutting brass or similar soft metal, belt it down so that the blade runs at half the usual speed, or less.

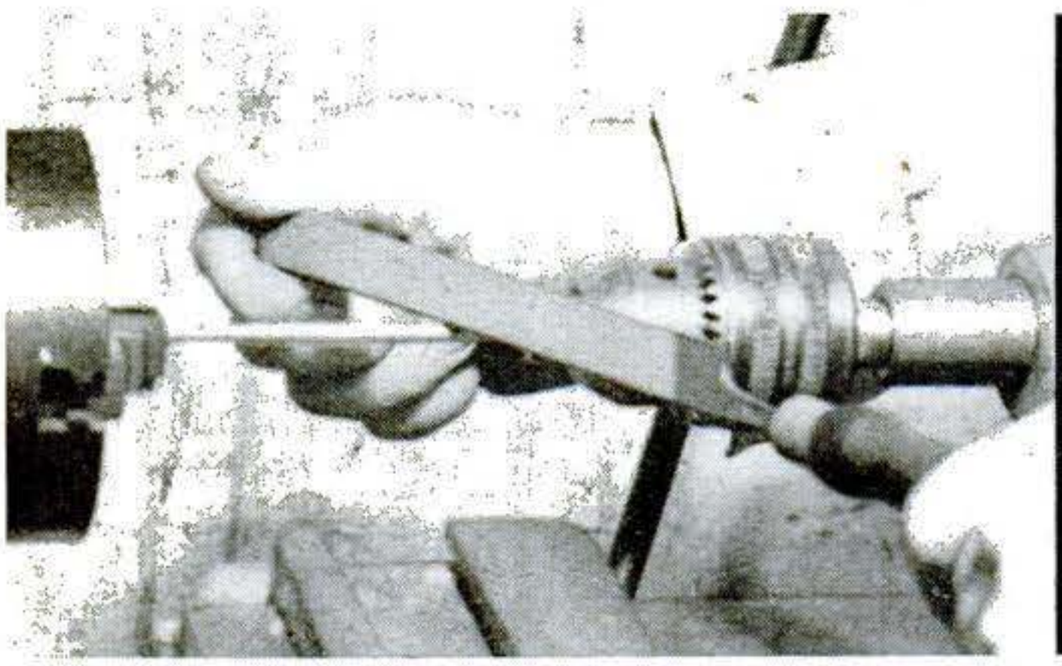
After the plates are sawed out, they should be smoothed up with triangular and half-round files. If you want to make a half-round file, grind a small rat-tail file to half-round shape. You only need to cut down about 2″ on the end of the file. Grind it



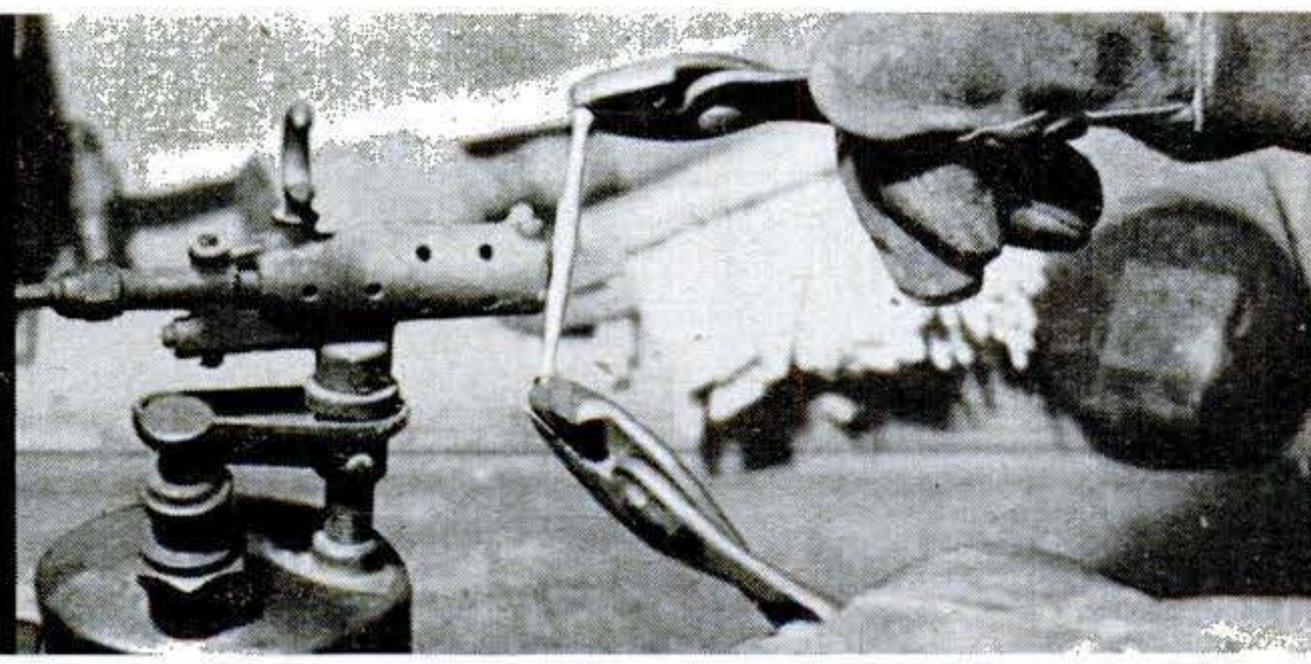
1. After edges of plates are dressed with file, plates are wire-brushed and buffed on a wheel.



2. Except for knob end, handle posts are turned down to a ¼″ diameter from ⅜″ brass rod.



5. Tool marks are removed from handle with file and emery cloth while work is still in lathe.



6. For first bending, handles are heated red hot. Wear gloves and use pliers to hold work.

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slowly, cooling the metal frequently so it won't lose its hardness. Next step is to bore the plates for the posts.

Making the Posts: Use the ⅜″ brass rod, cutting the pieces long enough to take care of the knob end, plate thickness, drawer thickness, and nut. Usually 1½″ over-all will do for ¾″ and ⅞″ wood and still allow plenty of metal on the knob end for machining.

First, turn the posts to ¼″ diameter—except the knob ends, of course. Then thread them ¼″-20. Machining the knob end comes next. The ball shape is often found on old brasses. Finally, drill 3/16″ holes in the knobs about three-quarters of the way through to take the handle bearings.

Cutting the Handles: To get the proper length, set up a plate and posts. Bend and shape a length of wire solder to the desired shape. When the piece of wire is straightened out, you have the correct length of the handles. The ends of the handles should then be turned down to ⅛″ for a loose fit in the post holes.

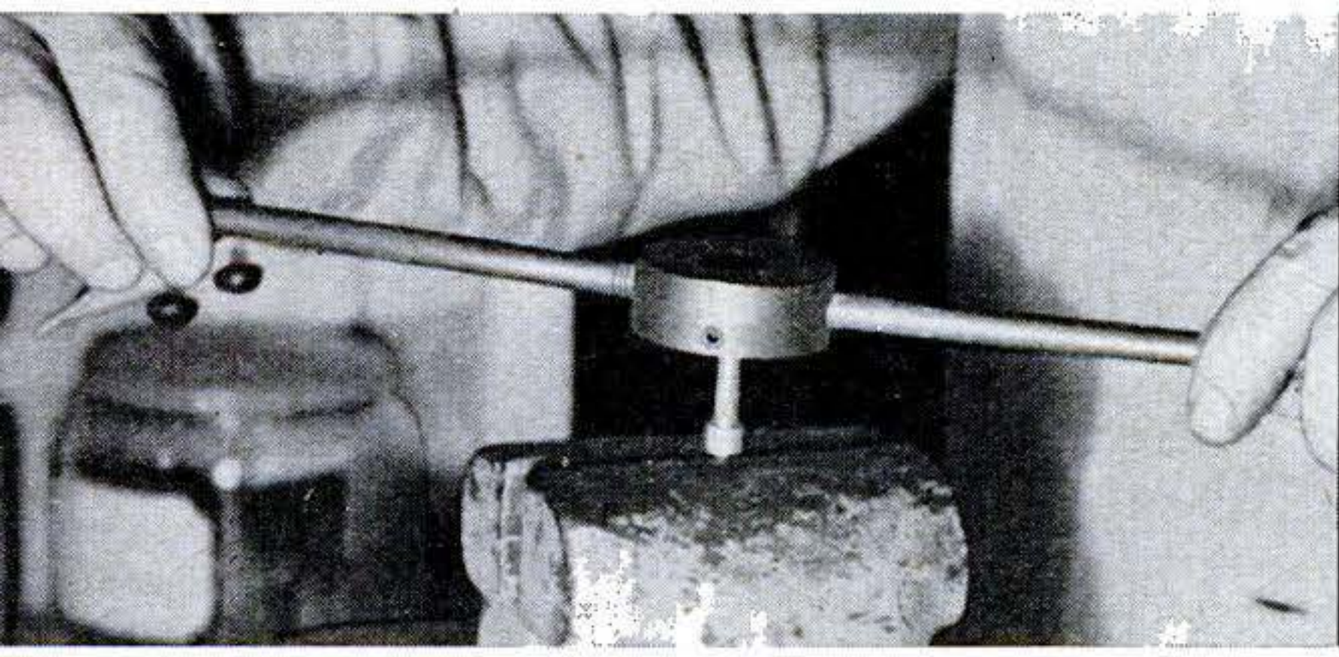
Shaping the Handles: Chuck one end in the lathe and give the other tailstock support. You don't have to be an expert to do a good shaping job. Several light cuts will get the shape started enough so it can be finished with coarse and then fine round files. Polish the handles with emery cloth while they're still in the lathe.

Now heat the handles to a cherry red and bend them to a U shape. Holding the handles at each end with pliers, you can easily curve them around a rod held in a vise. Then lock the handles in the vise, using wood scraps to protect them from the jaws. Heat the ends and bend them to their final shape.

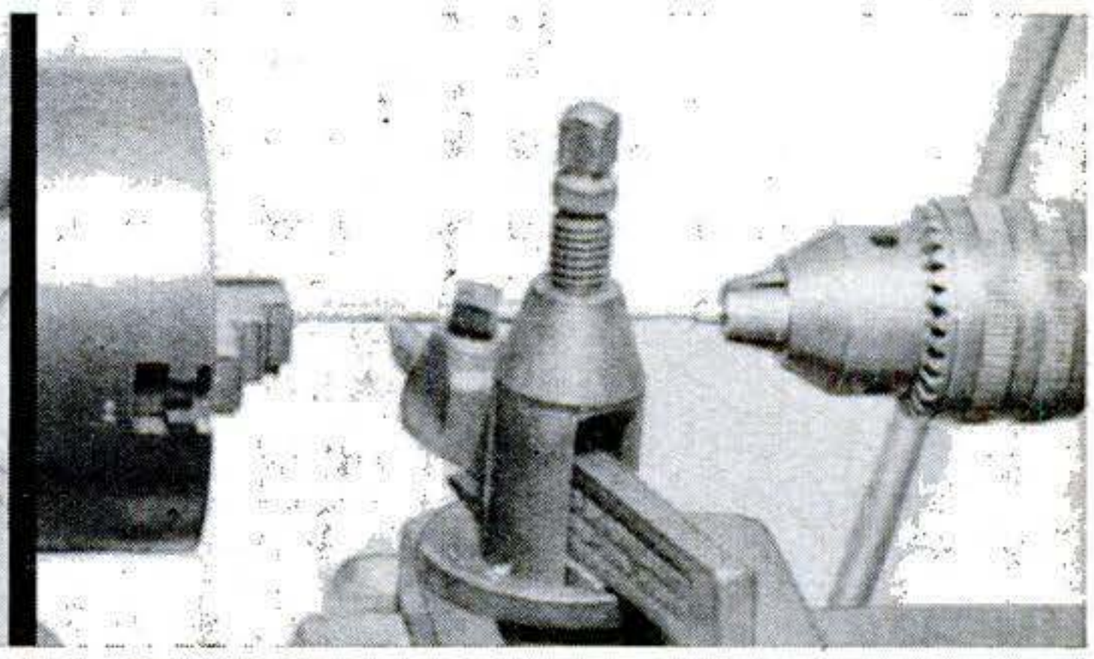
After they have cooled, test them to see if any slight adjustment is necessary so they'll swing freely in the post holes. Slight bends needed at this point usually can be made cold by squeezing the handles in the vise or tapping them lightly with a hammer.

Where plans call for escutcheon plates, they are usually cut from the same thickness of sheet brass. The same design is used. Usually, they're made smaller in size than the handle plates.

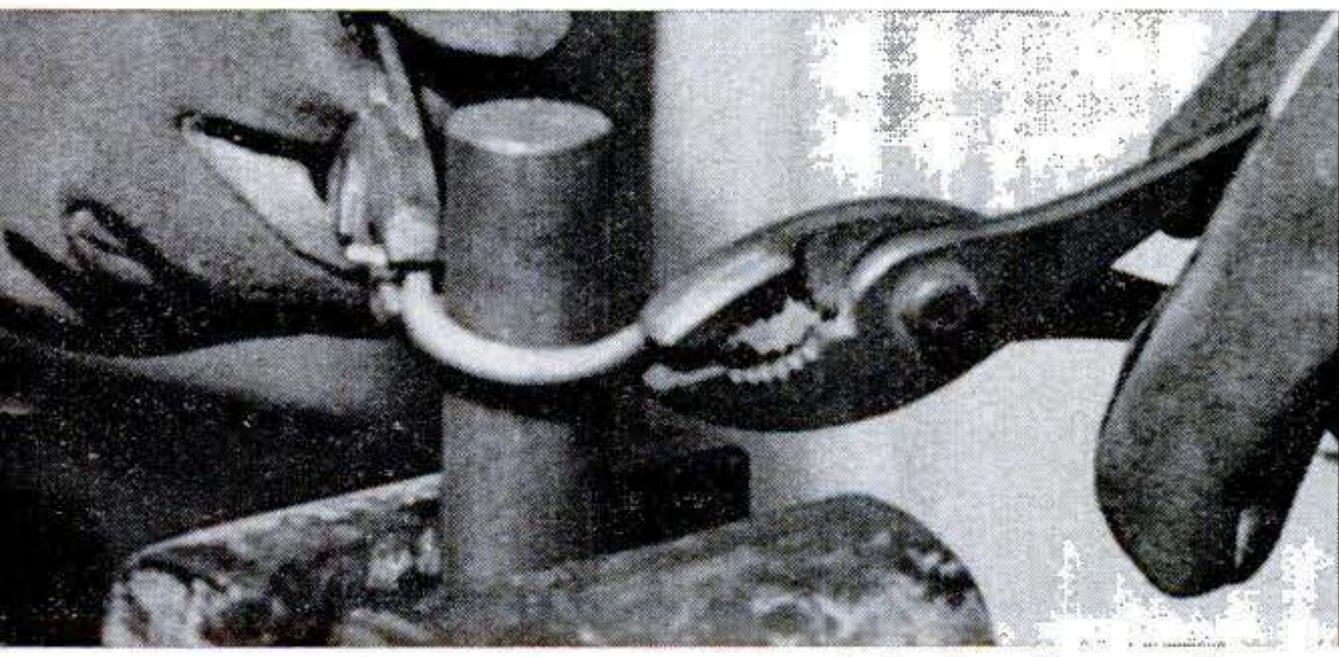
Although only two styles of plates and handles are shown, there are dozens of others to suit the type of furniture you're building. Many art museums display authentic examples of fine plates and handles. Books on Colonial furniture at your local library are another good source for designs.—*James B. Leeth, Cullman, Ala.*



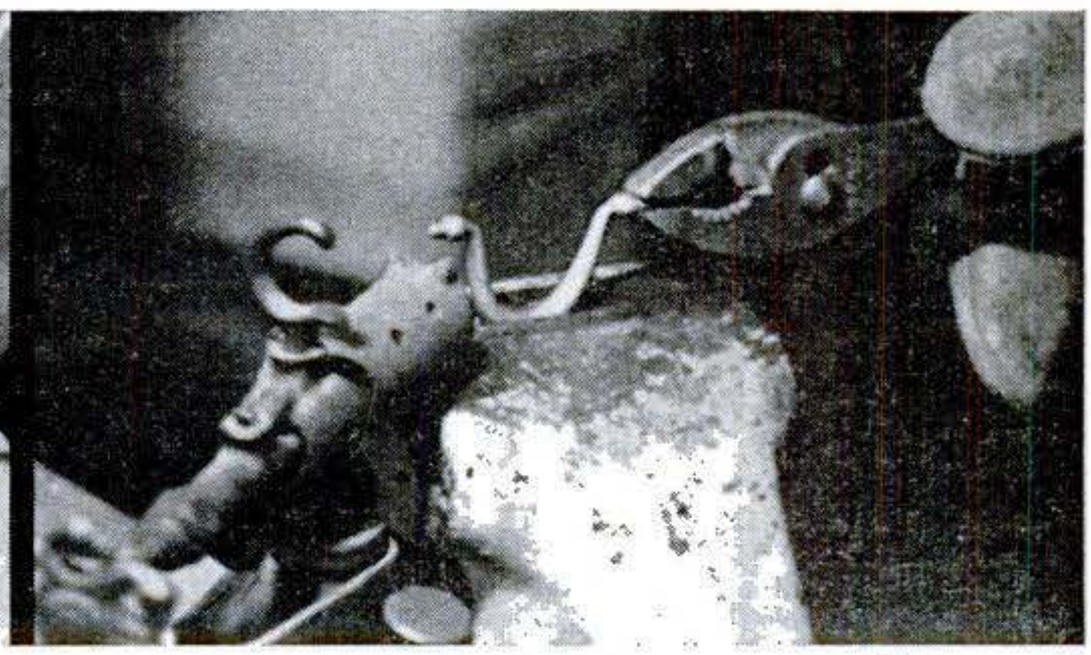
3. With a die, run a short ¼″-20 thread on the handle posts. They're screwed into the plates.



4. Handle blank is shown above chucked in lathe and supported by drill chuck in tailstock.



7. When entire length of the handle is red hot, quickly shape it around metal rod held in vise.



8. Bending of the handle ends is done with work locked in vise. Ends are bent with pliers.

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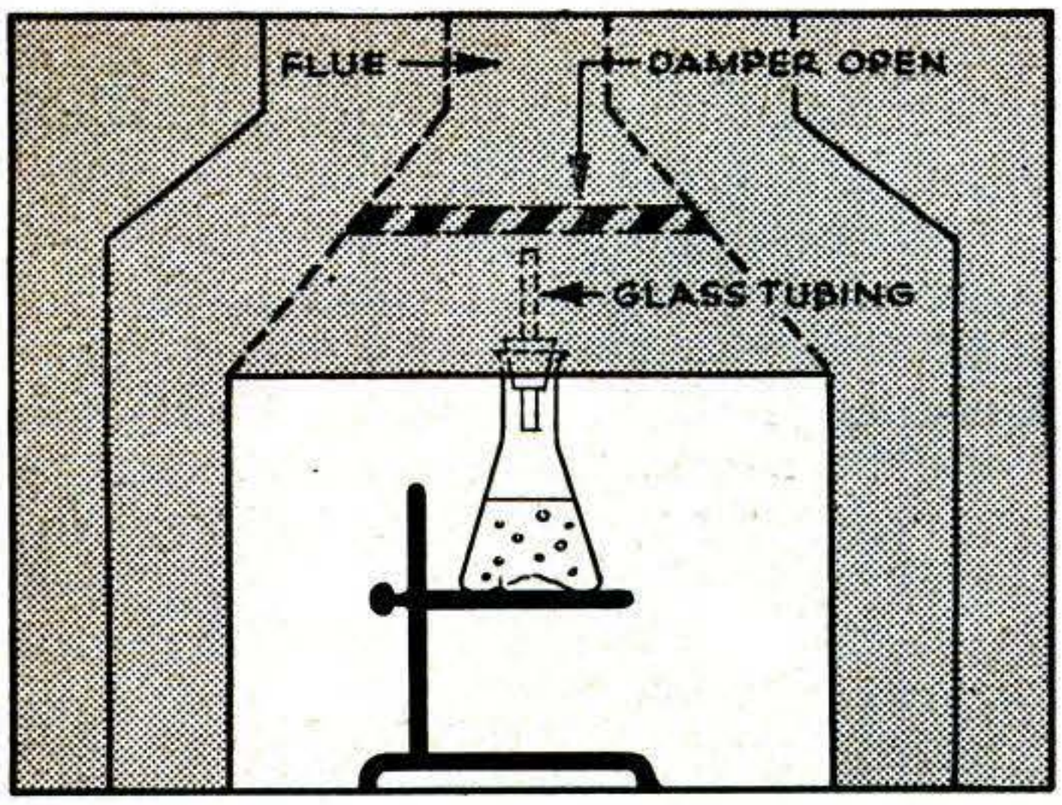


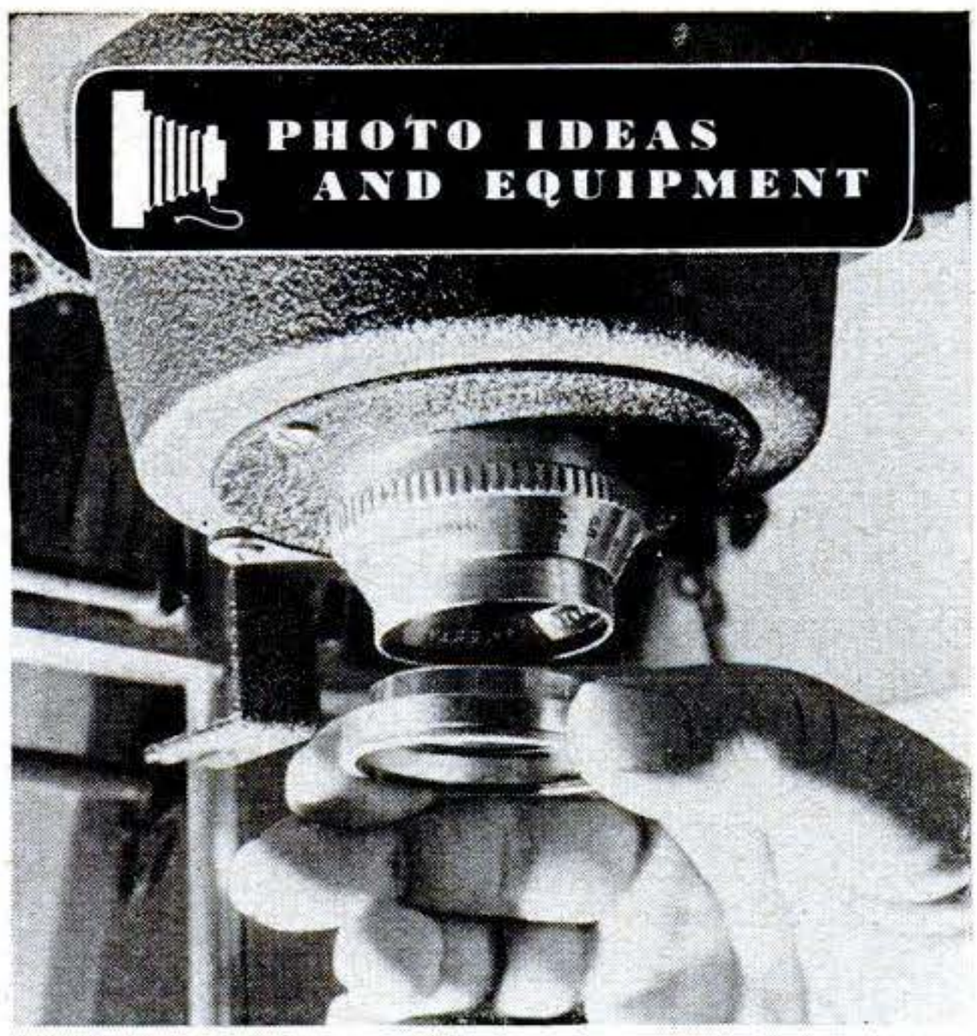
Fireplace Aids Home Chemist

YOUR chemistry experiments needn't smell up the house if there is a fireplace available. It makes an excellent hood. The apparatus should be set up high inside the fireplace and equipped with a long glass tube to bring the fumes near the flue. The damper must be opened all the way. If your experiment requires heat, or produces heat itself, the warm fumes will go straight up the chimney.—*R. J. Foster, Arlington, Mass.*

The Height of Ingenuity

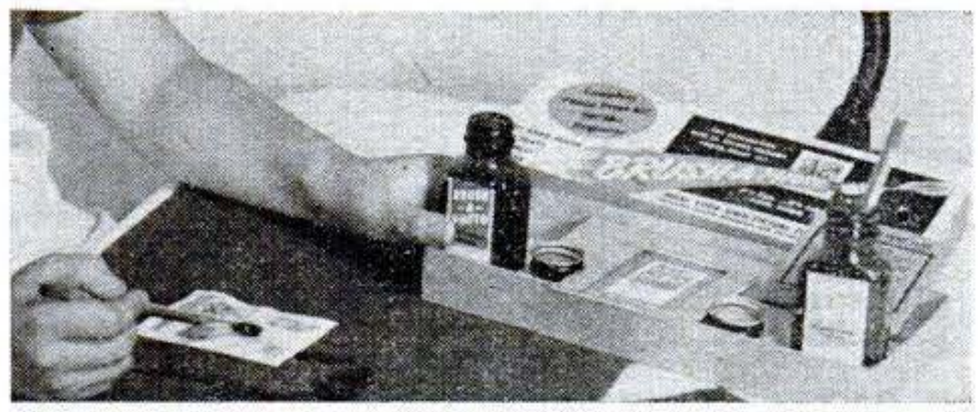
We knew the conduit dead-ended in the wall, but finding the capped end meant tearing out a lot of masonry. We located it exactly before any cement was cracked away. How do you think we found it?

We attached a small bar magnet to a copper wire and fed this into the conduit. The sealed end of the conduit stopped the wire and magnet. Then we moved a compass over the outer wall. The needle pointed directly to the magnet in the wall. —Federico Strasser, Santiago, Chile.



Enlarge Enlargements. A slip-on supplementary lens of the type used as a portrait attachment for a camera can also be put to work on an enlarger. Placed over the lens, it enables you to get a bigger enlargement right on the easel, instead of having to swing the enlarger so as to project onto the floor.—*Virginia Hanson, Santa Monica, Calif.*

Cork Holds Thermometer. To find the temperature of a photo solution in a large bottle, drill a hole through a cork and push the thermometer through it. The cork will then support the thermometer as shown. Leave the cork on. It will help protect your thermometer when you put it down.—*Will Thomas, Kenmore, N. Y.*



Brush Develops Photos. Printing pictures is easy for children with the Brush-A-Photo® kit made by Gopher Laboratory, Minneapolis. A printing frame containing your negative and a special paper is held near a light bulb. Developing and fixing solutions are then brushed right on the paper, and the print is ready to be washed and dried.

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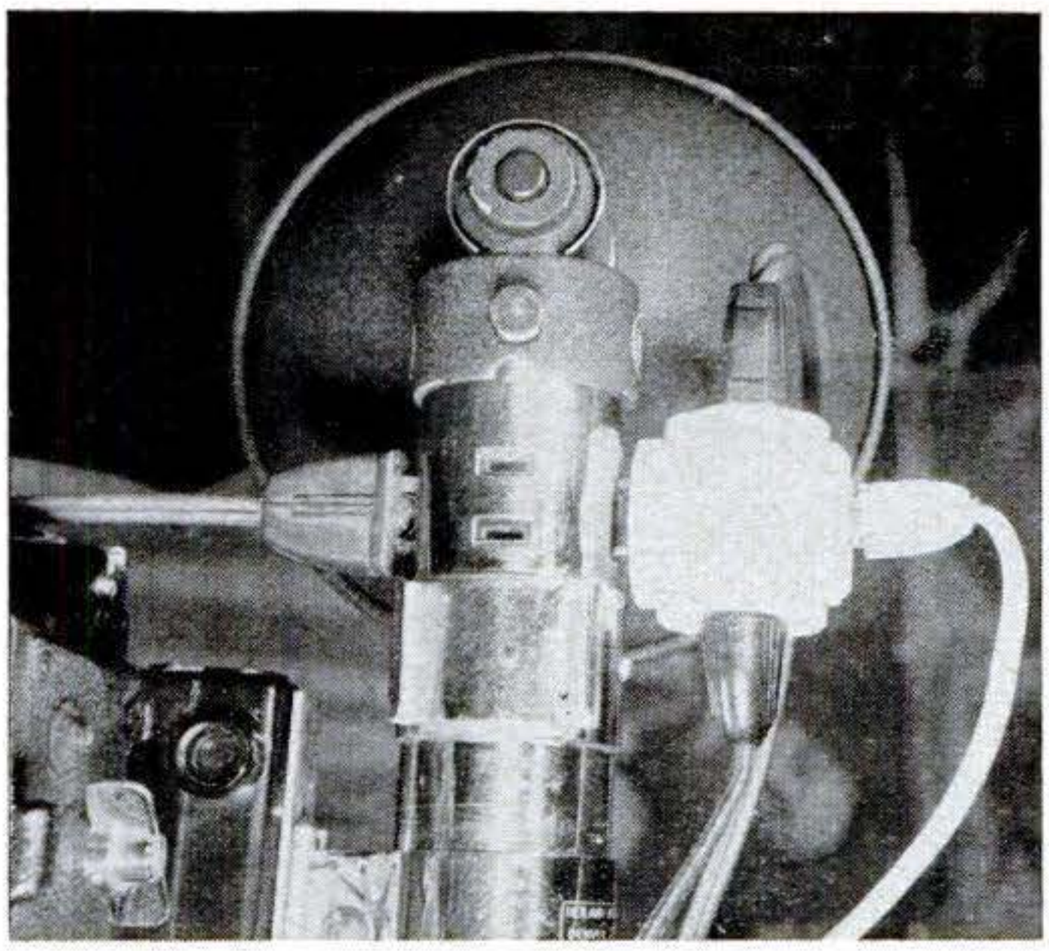
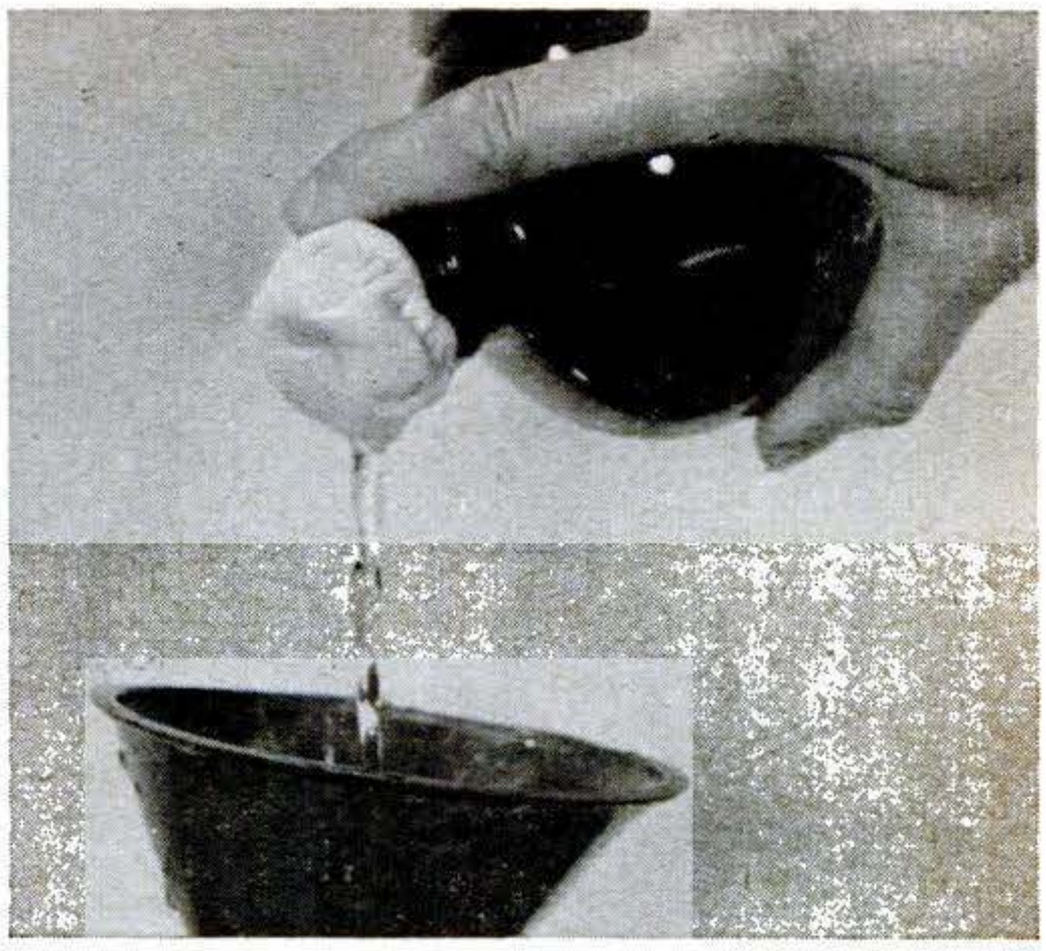
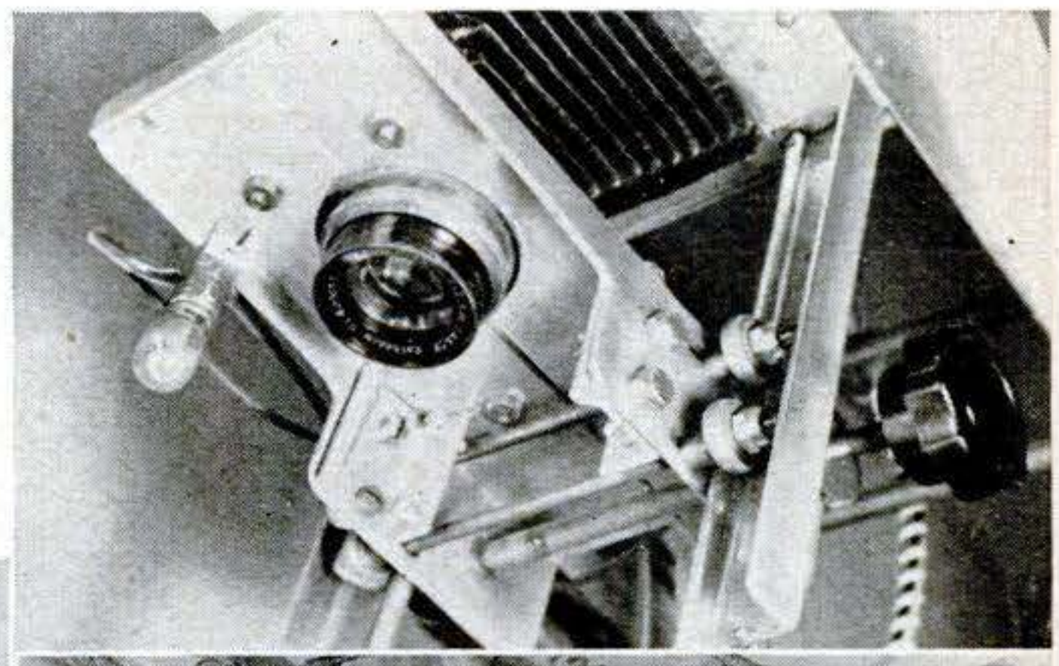


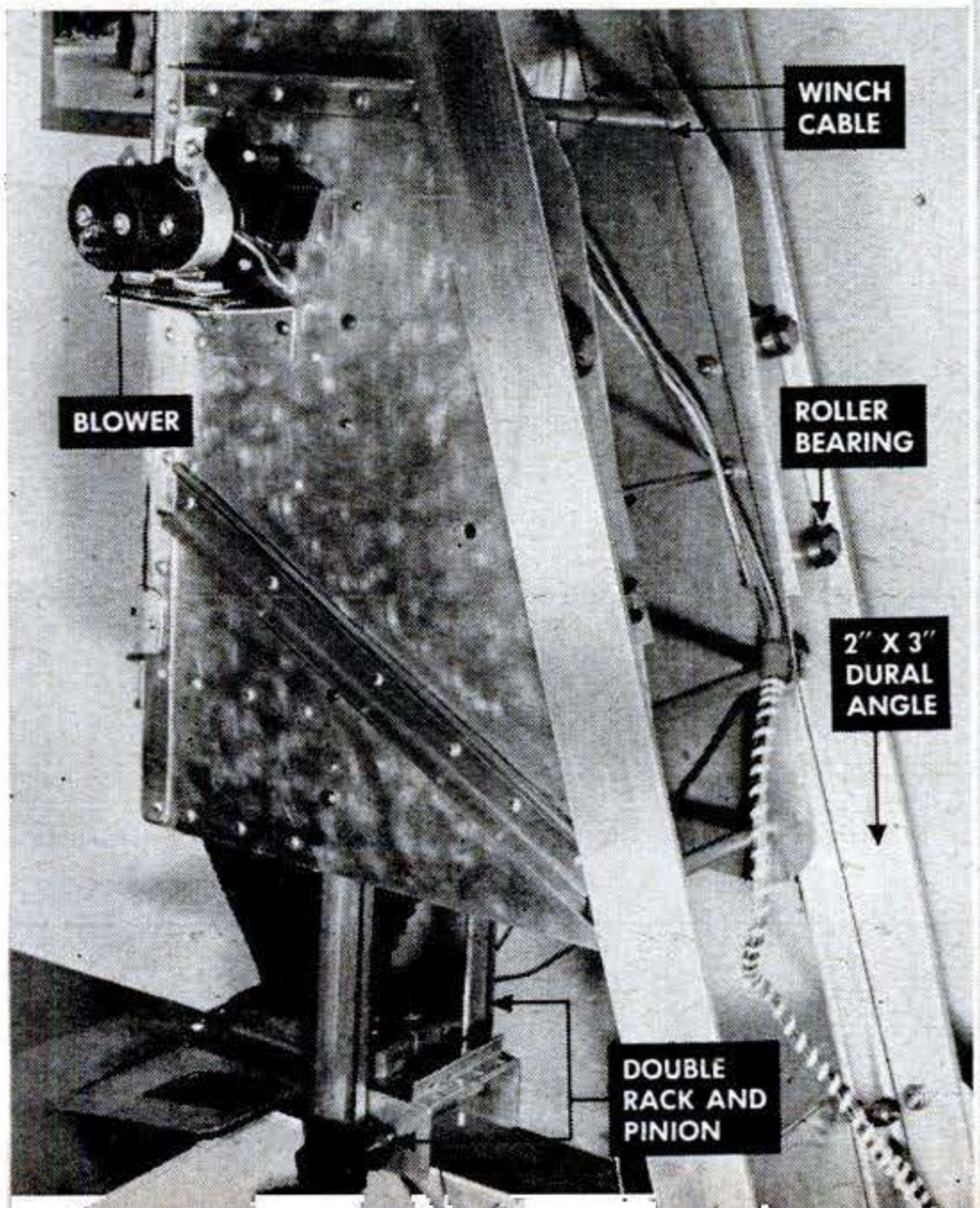
Flash Solution. Plugged into a flash gun, an ordinary triple socket lets you increase the number of light units in an extension-flash setup. Another idea: if you're short of flash reflectors, plug a floor or table lamp into the socket and substitute flash bulbs for the regular bulbs.

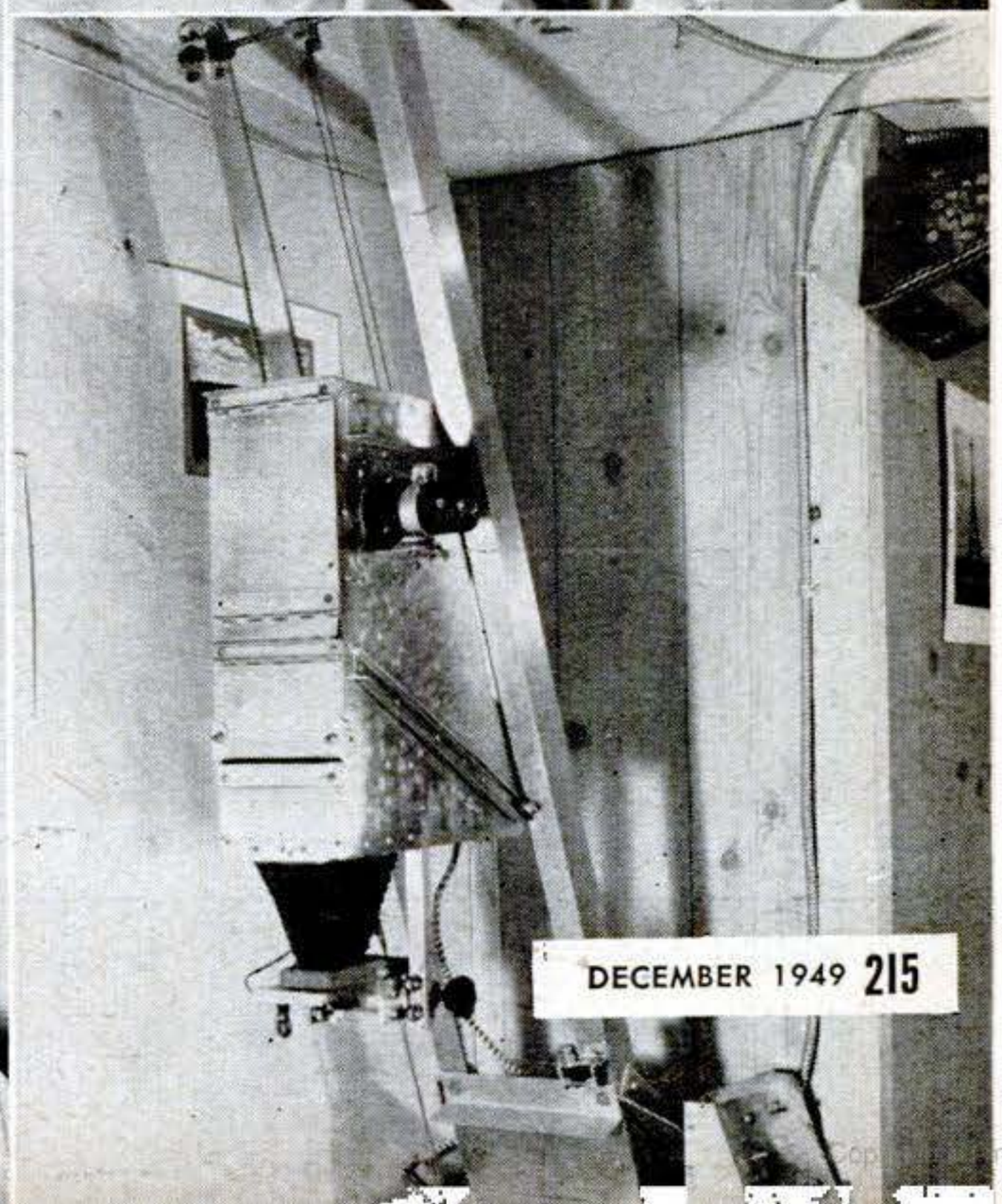


When Your Wife Isn't Looking . . . A cloth strainer of the type used in some glass coffee makers provides a good filter for photographic solutions. Slip it over the neck of the bottle and pour the solution into another container.—*Virginia Hanson, Santa Monica, Calif.*

Motor Drives Enlarger. When Donald B. Terrana, of Brooklyn, N. Y., throws a switch, his homemade enlarger moves up all by itself. It has an electric motor—a 24-volt, war-surplus item—that raises the head by winding a winch cable on a drum. Two midget spring-action switches, one at the top and one at the bottom of the dural frame, limit the travel in either direction. The head rides on roller bearings and lowers by gravity. Other features built into this slick job include an exhaust blower to cool the lamp and provision for color-correction filters in the condenser system. There is even a small red lamp (top photo below), controlled from the switch panel, to illuminate lens-diaphragm markings. The enlarger handles negatives up to 3¼" by 4¼".







Check through your color file. Here's a good darkroom project for the winter evenings ahead.

Big blow-ups come from little color slides. You can make a negative or use reversal process.

Print Black-and-Whites From Your Color Shots

YOUR color transparencies can be used to make black-and-white prints in either of two ways. You can make a negative from the transparency and print from it, or you can print positives directly on paper by a reversal process.

For negatives you need only the materials and equipment used in ordinary black-and-white processing. Panchromatic film is best since it's sensitive to all colors.

Making contact negatives. Some people argue that making negatives by contact is the most reliable method. It certainly is less fuss and bother. You do it exactly as if you were making a contact print—except that you substitute a piece of cut film for the paper. (But be sure to fit the transparency against the emulsion side of the film. This side faces you when you can feel the notch in the upper right corner.)

For this and other negative processes use slow or medium-speed film. Length of exposure will depend on the light intensity, but it probably won't be more than a couple of seconds. In using either a contact printing box or a printing frame be sure the light is well diffused or you may find a "hot spot" on the developed neg.

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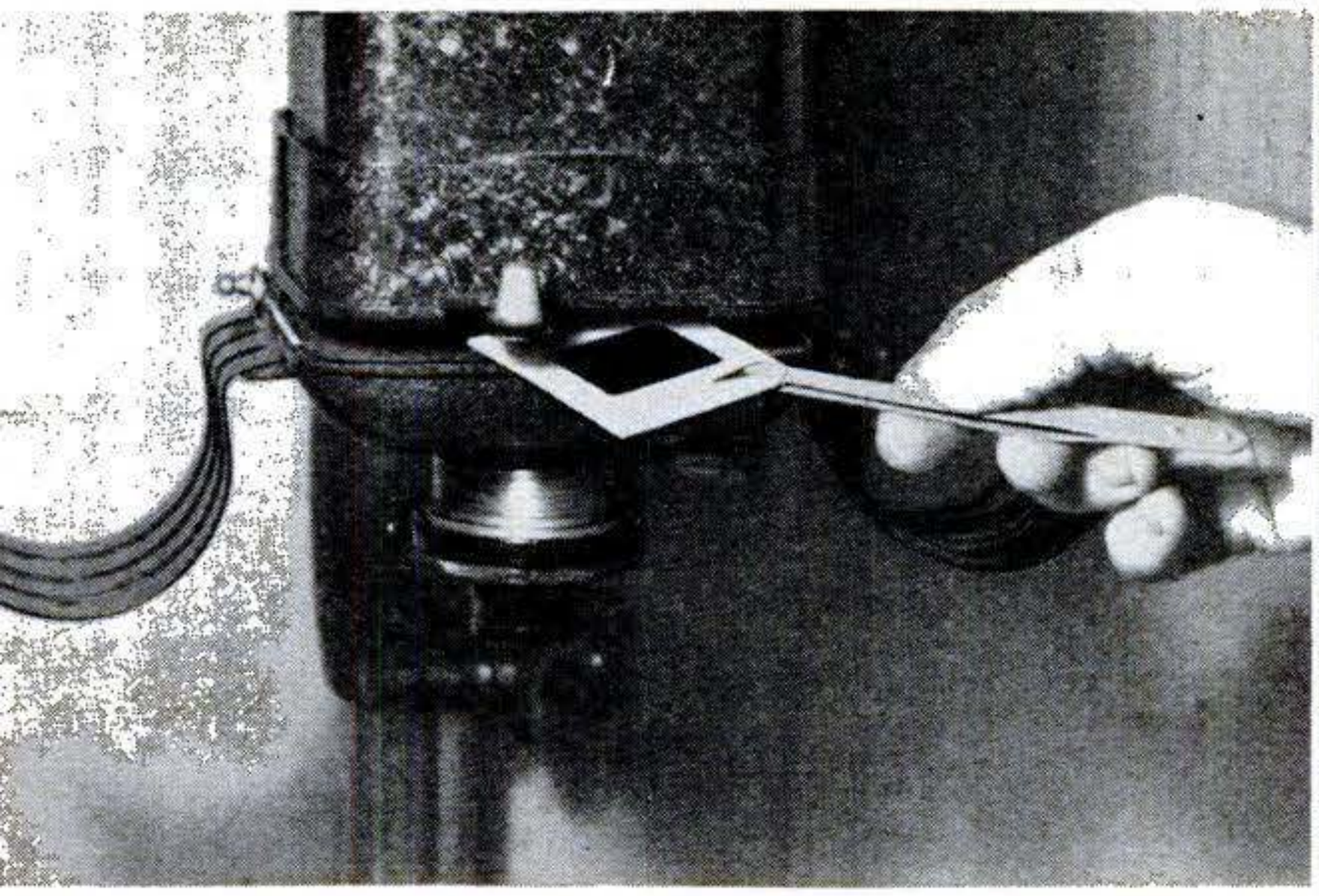
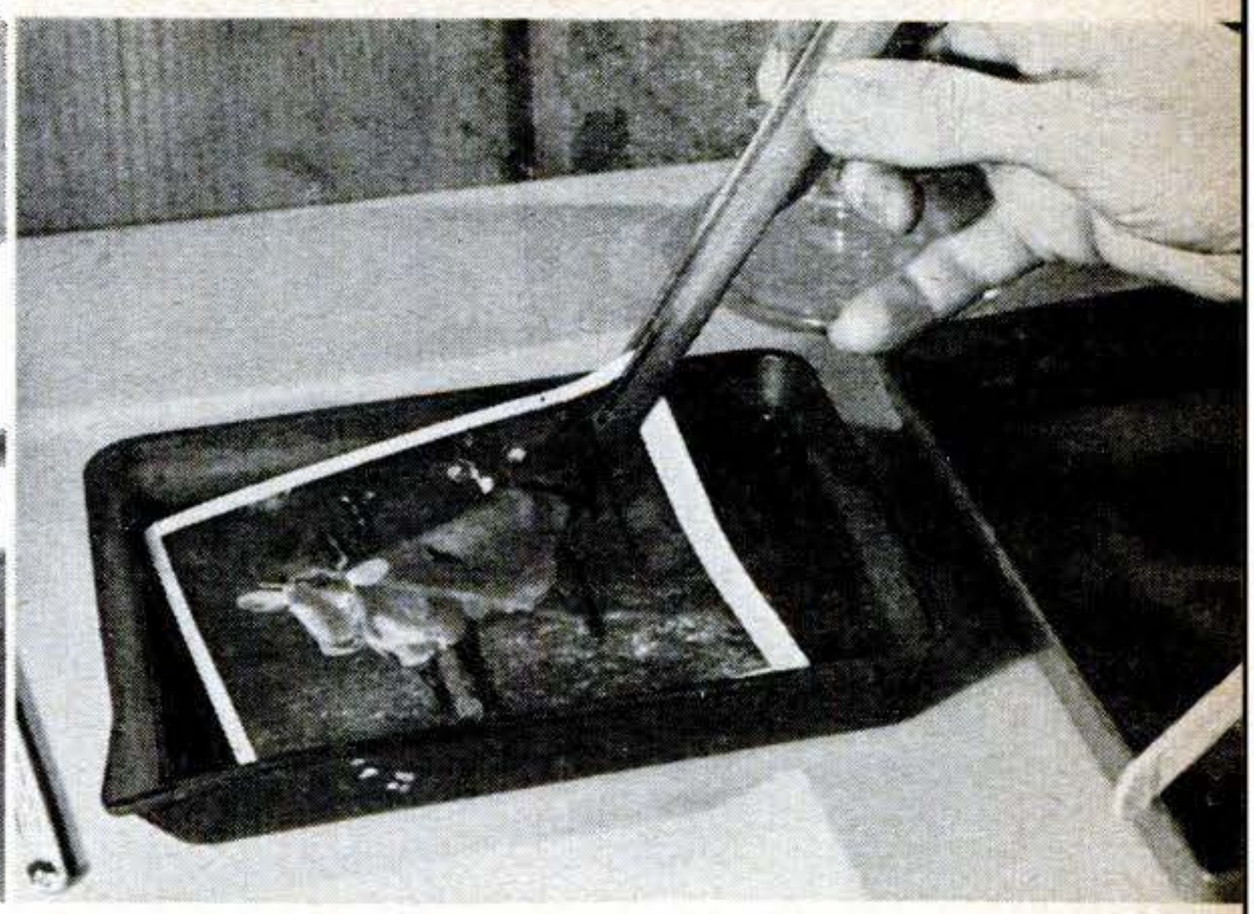
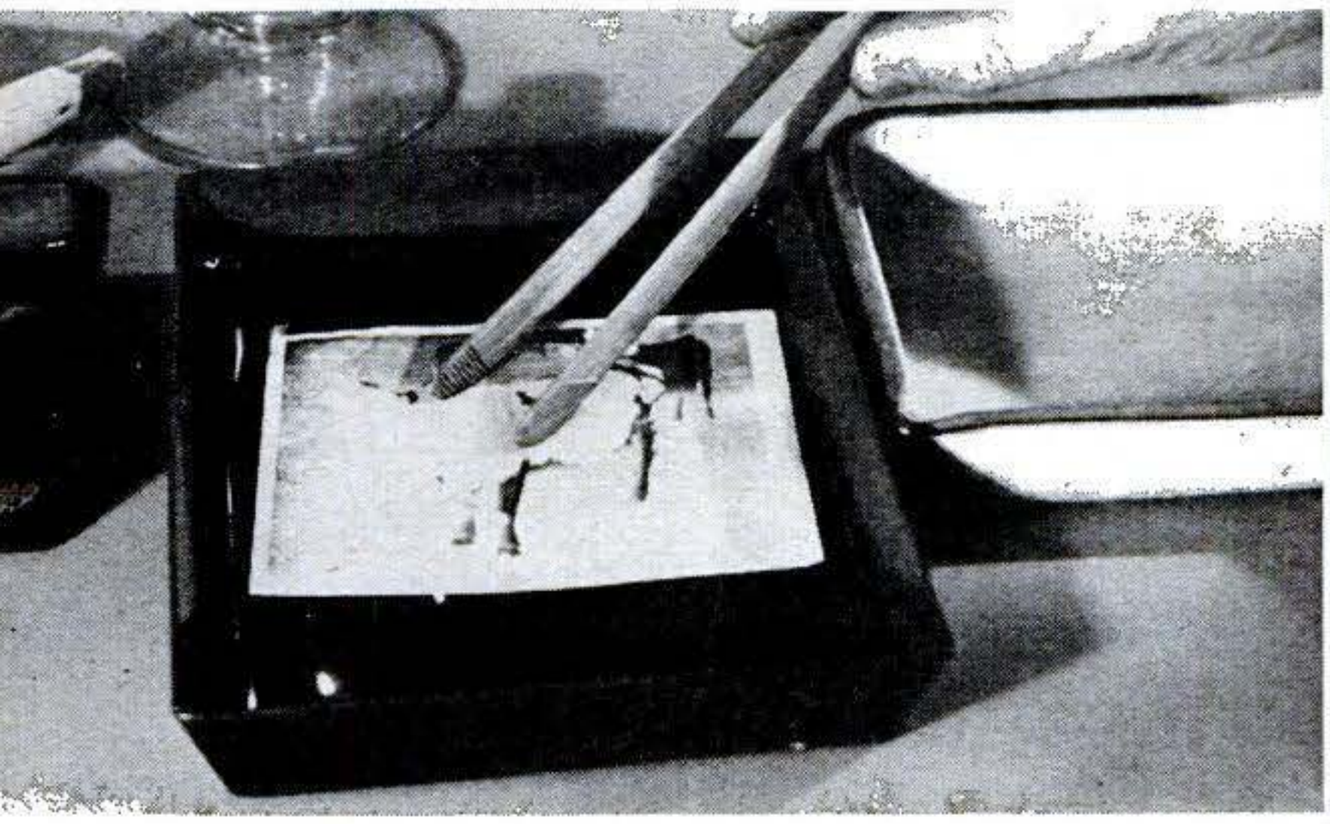


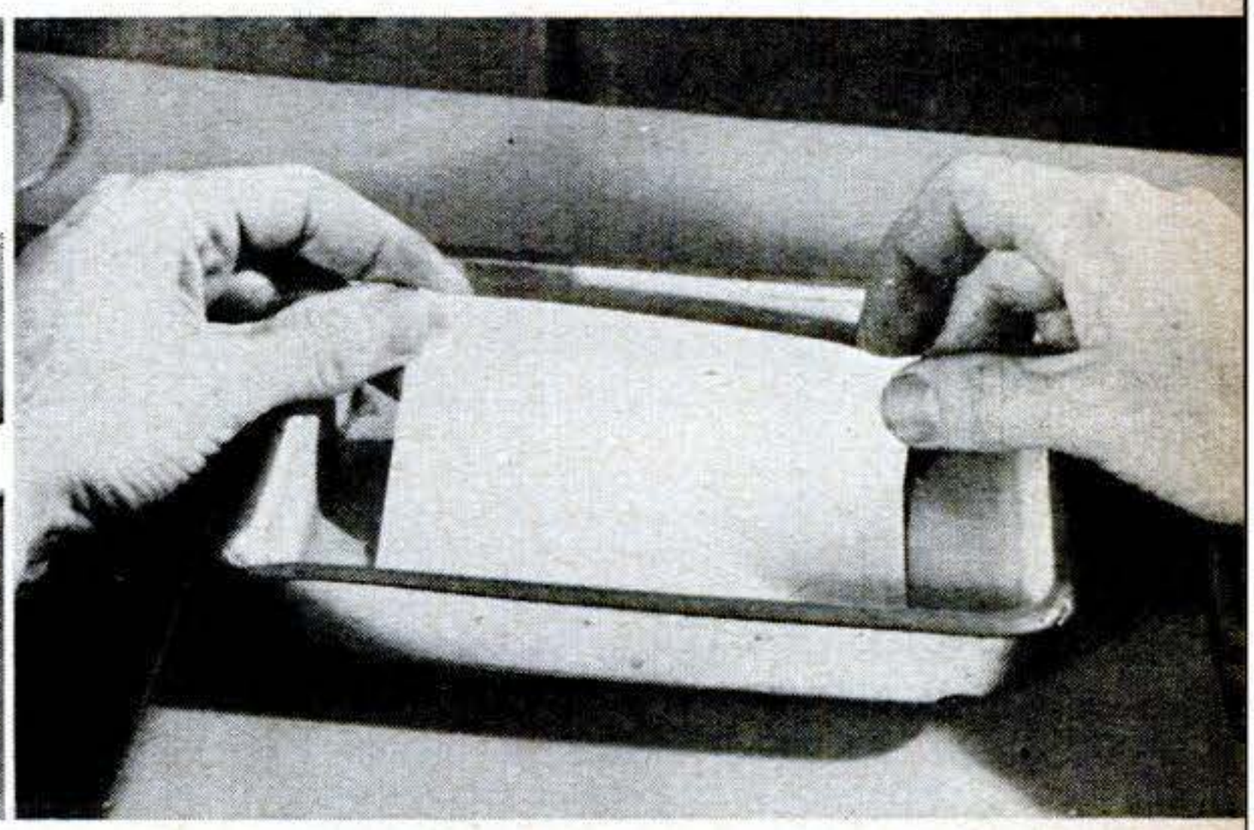
1 For reversal process, transparency is projected on enlarger easel. In an enlarger of above type, tweezers make it easier to handle slide. Determine best exposure by test prints.



2 First developer. Exposed paper goes first into full-strength stock developer. Leave it in until the image is almost fully black. Note that this gives you a negative print.



3 Bleach. After rinsing in water, print goes into a potassium bichromate bleach. Negative image rapidly disappears, leaving a yellowish stain that forms a faint ghost image.

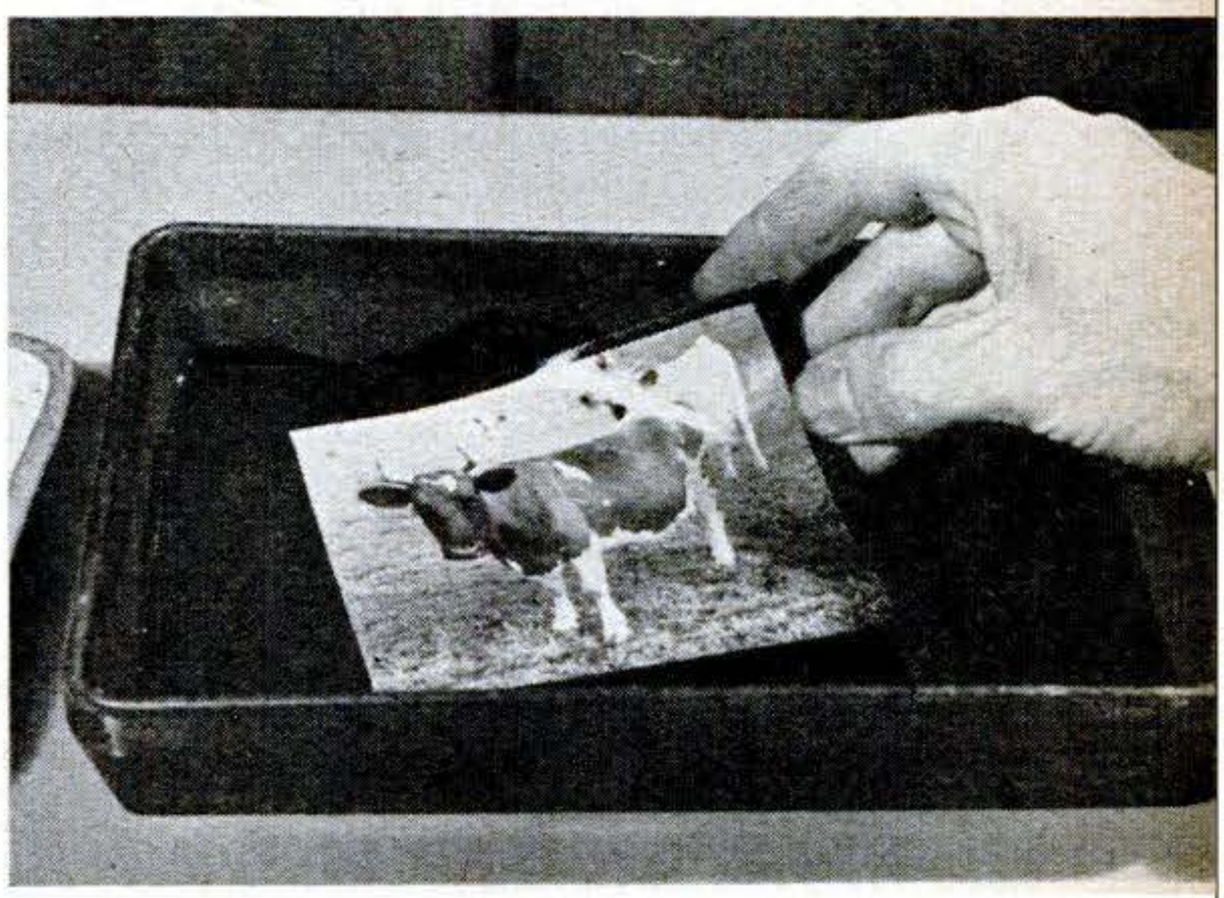


4 Removing stain. Rinsed thoroughly again, the bleached print is next immersed in a sodium sulphite clearing solution to remove the stain. White light can now be turned on.

Contact negatives are most suitable for transparencies made on 120 roll film or color film in the cut-film sizes. They *can* be made from 35-mm. or Bantam transparencies, but the transparencies must be taken out of the mounts to get proper contact with the film.

Making enlarged negs. If you have an enlarger, this is the method you'll want to use for 35-mm. transparencies. You need not demount the transparencies, and you can enlarge the negative and crop the picture easily if necessary. There is no grain in color images because they are formed with dyes. Hence, if you enlarge your tiny transparencies to a 2¼″ by 3¼″ or 4″ by 5″ negative, you can go on to a huge paper print without the silver grain becoming noticeable.

To make an enlarged negative, you ➧



5 Final developer. The rinsed print now goes into second developer, this time to bring out the positive image. Note that border, which was white in previous photos, is now black.

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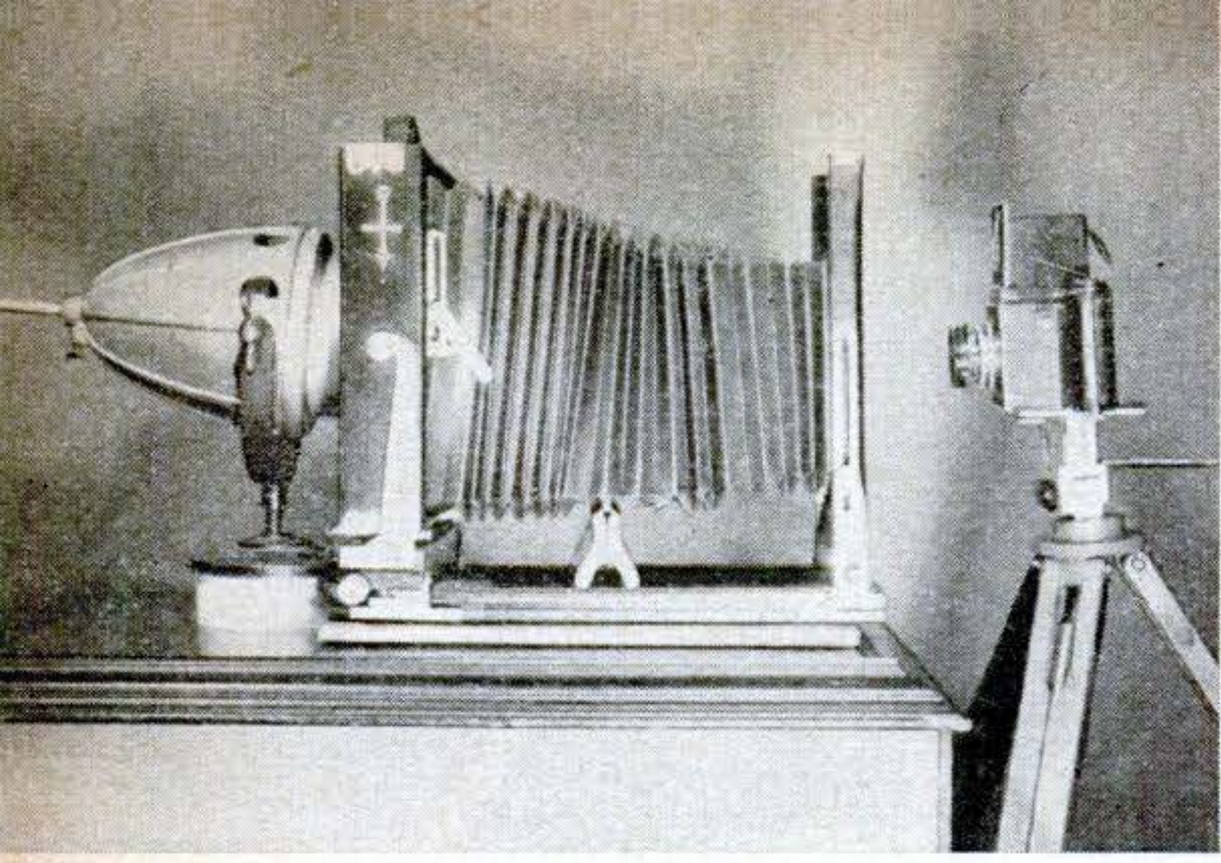
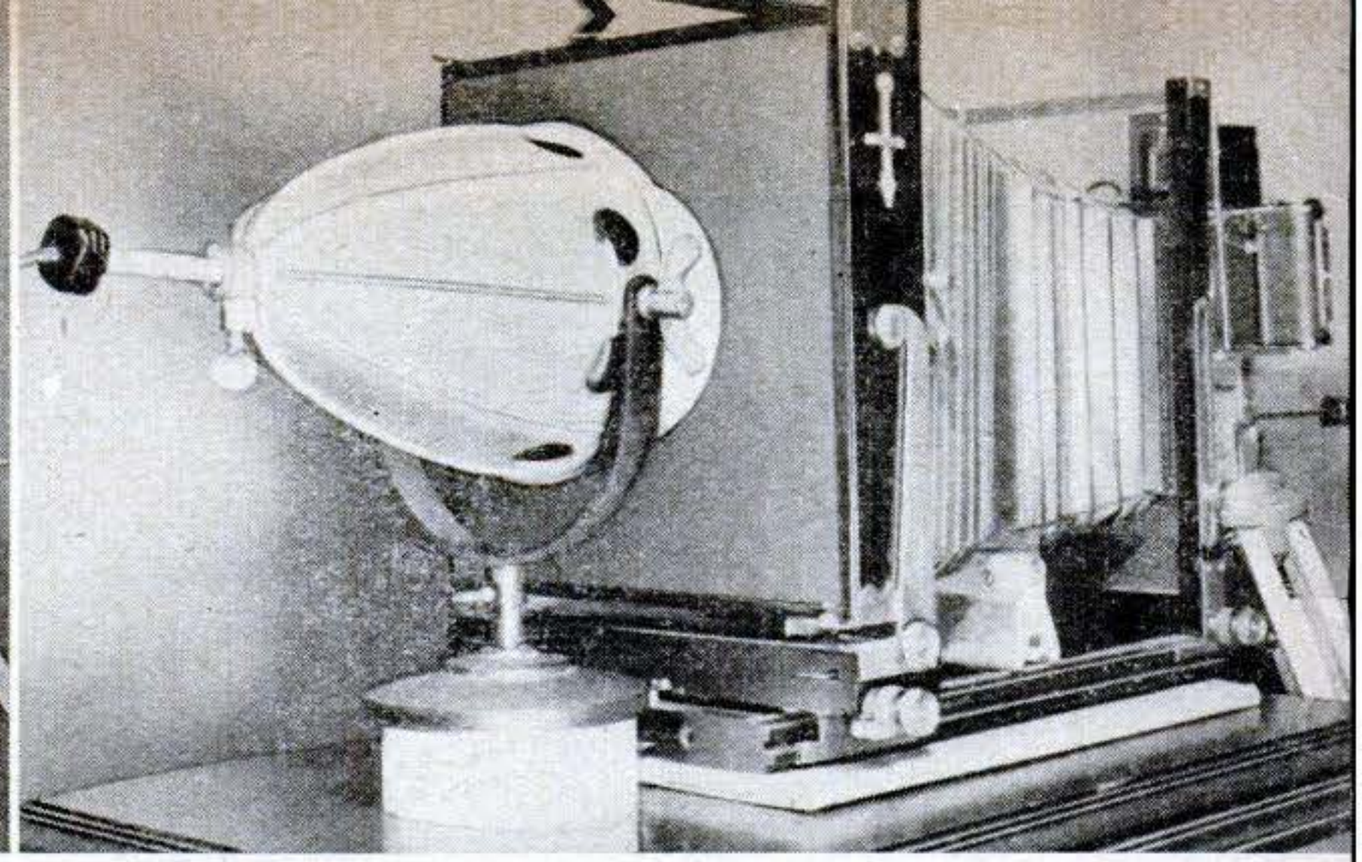
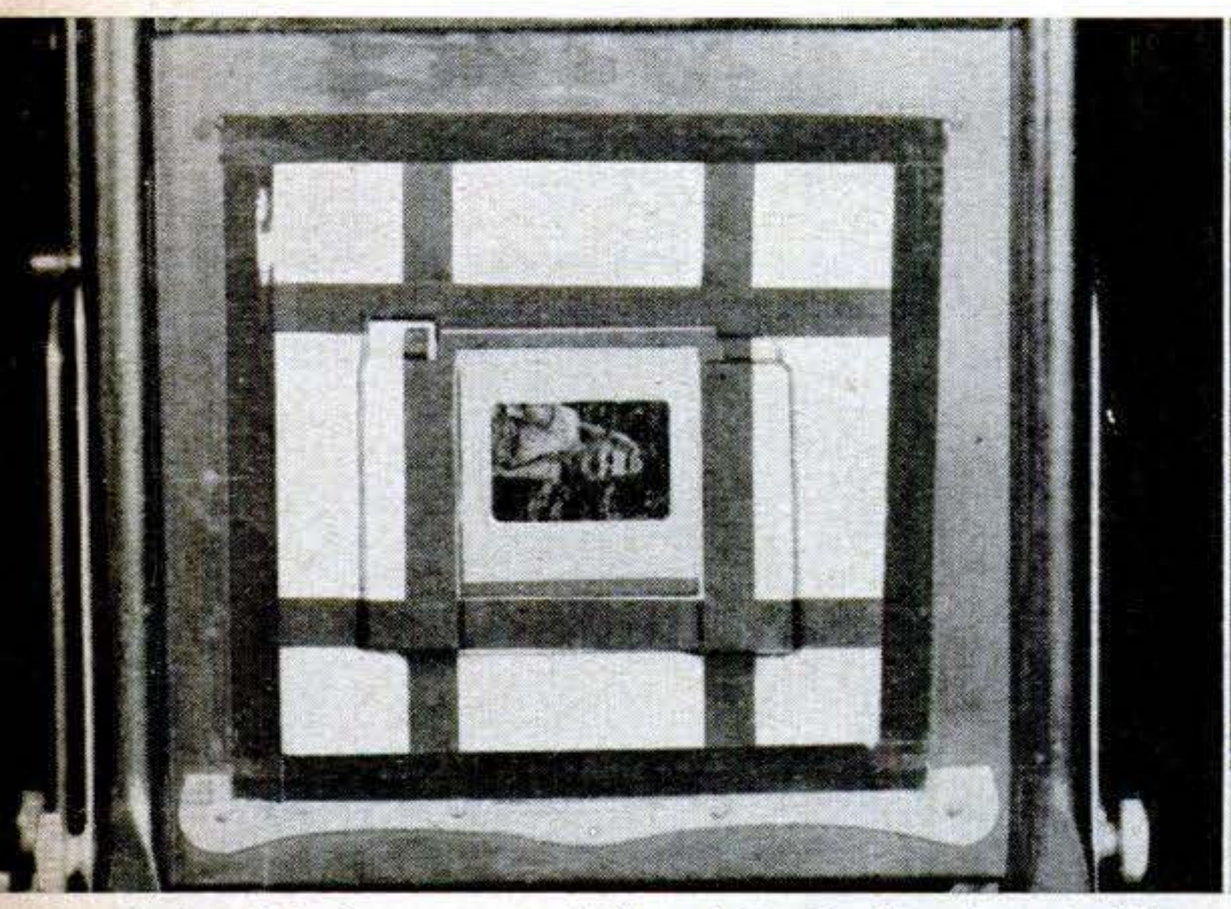


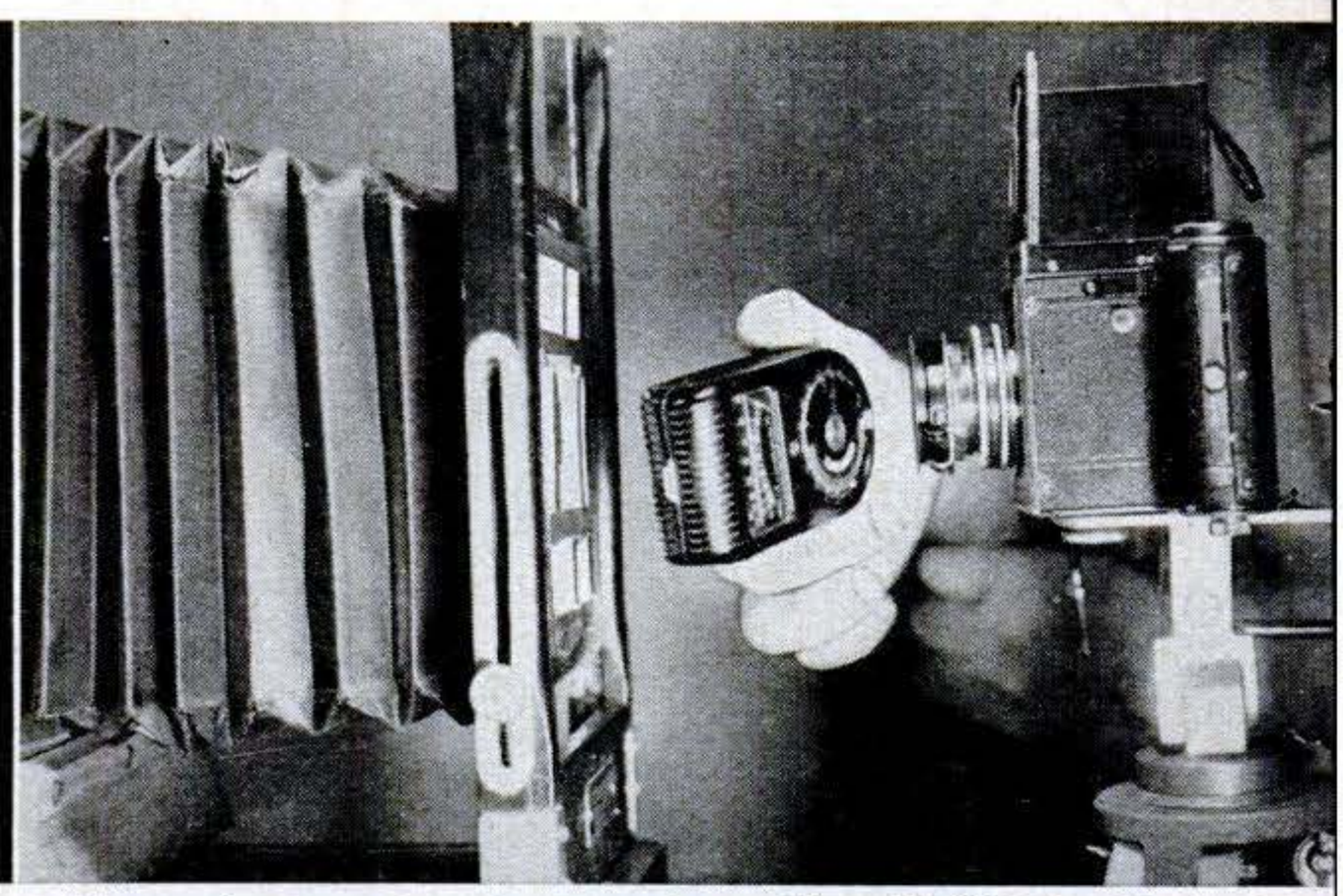
Copying the color slide is another way of making a black-and-white. Above is setup used by Lynwood M. Chace. Enlarging lens over regular camera lens lets camera be placed close.



Spotlight illuminates transparency from rear. The spot is thrust through hole cut in heavy cardboard substituted for ground-glass back of view camera. Cardboard is painted dead black.



A slide is mounted like this. It slips into holder built around opening cut in piece of plywood that replaces lens board. Opal glass in bellows between light and slide diffuses light.



Meter insures correct exposure. Plus X film is used in the copying camera. Developing for 18 minutes at 70° F. in fine-grain developer gives negatives of good printing quality.

must make the exposure in absolute darkness. Drape a black cloth around the enlarger to stop light spilling from it. Place the transparency in a glassless negative carrier and insert it in the enlarger so that the projected image will be reversed.

To focus, slide a film-size sheet of white paper into a cut-film holder on the enlarger easel. To keep the holder from being moved accidentally after you have focused, a block of wood can be used as shown in the photo on page 219.

After focusing, substitute a piece of film for the white paper, in total darkness. Then cut down the enlarger diaphragm a few stops, and make the exposure by switching on and off the enlarger. A second or two should do it.

Making copy negatives. This way you actually photograph the transparency, illuminating it by a light source placed on the side opposite the camera. Lynwood M. Chase, Swansea, Mass., who specializes in nature photography, believes this gives better results than any other method he has tried. He does it as shown above.

A view camera with its bellows extended 10″ is used to illuminate and hold the transparency. A piece of opal glass cut to fit into the fold of the bellows 6″ from the front of the camera diffuses the light thrown by the spot.

He uses a Reflex Korelle for copying. Even though an enlarging lens is used over the regular lens, best results are obtained by keeping the negative about the same size as the original transparency.

Making direct positives. Here you use paper. First, you develop a negative image; that is, tones are reversed as in a film negative. Then you bleach out this image. Finally, you develop the print

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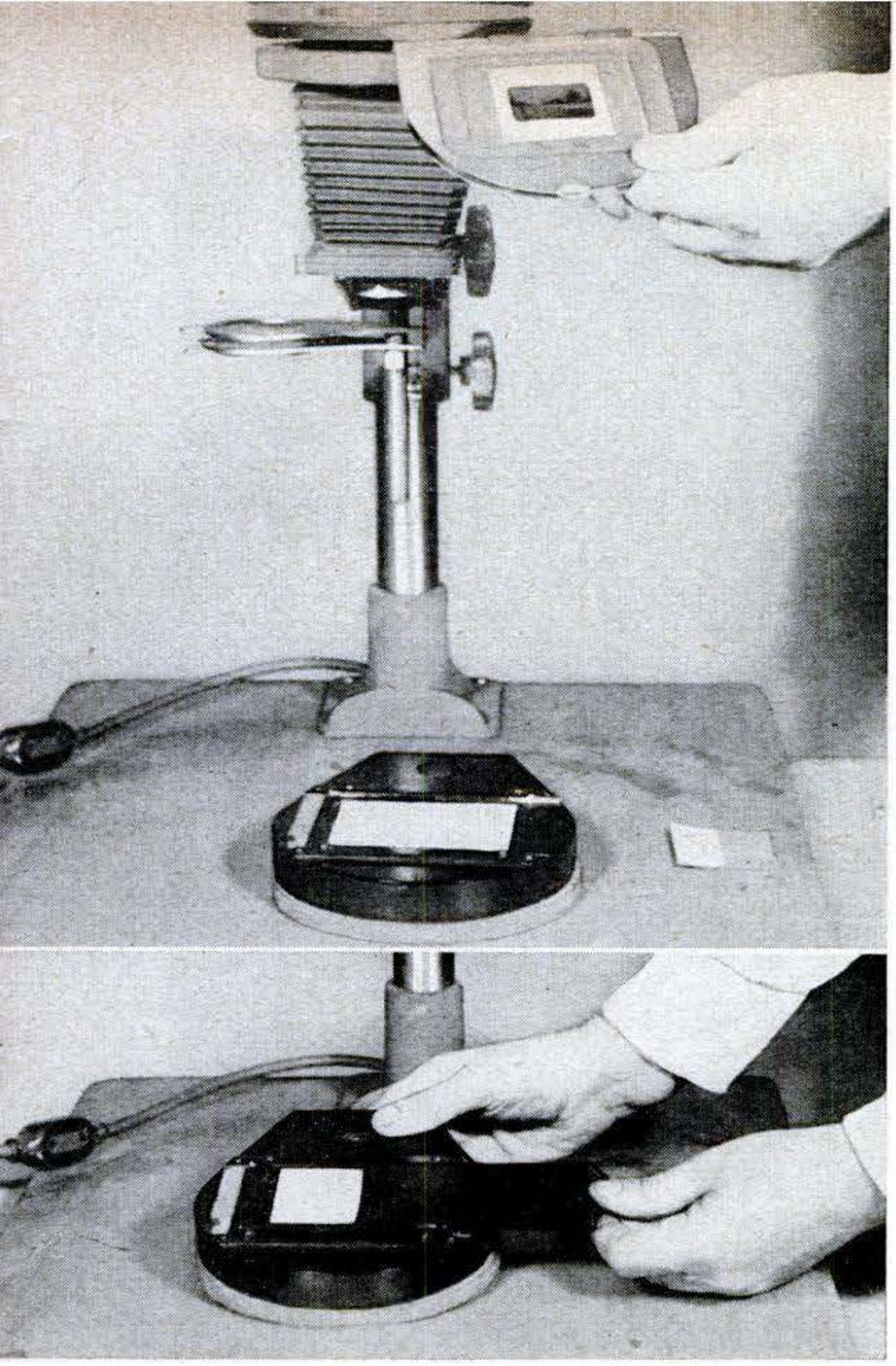

Enlarged negative can be made by placing the transparency in your enlarger. Project image on sheet of cut film after focusing on paper. Mount film holder on block of wood as above.

again. This brings up the positive image.

You can buy special reversal paper, but it's possible to do the job with ordinary enlarging paper such as Kodabromide® F-3 or Defender Velour Black® R-3.

A glassless holder in the enlarger is desirable, for glass is likely to produce Newton-ring images. Since the print, in the first development, must be developed until almost fully black, it's advisable to have a stronger light than usual to cut down exposure time. A rheostat for regulating lamp brilliancy is also a help.

With the first transparency, determine exposure by making test prints. When this has been accomplished, you can use a meter for later prints. Leaving the enlarger set for the first print, take a reading by placing the meter against the lens.

As an example, suppose the reading is 10 footcandles on your meter and the test-strip exposure for the first transparency was 30 seconds. For the next one, again put the meter against the lens and adjust the rheostat until the reading is 10 footcandles. Then the exposure again will be 30 seconds. This method does not allow for contrast variations in the slides, but it's close enough most of the time.

For the first developer, a stock solution of the D-72 type used full strength gives good results with a fairly contrasty paper. Another that's often recommended is Kodak D-88. Develop the print until the image has gone almost uniformly black, with only faint traces of detail remaining in the most contrasty parts. This will take a minute or two. Then wash about 30 seconds.

The print is now ready for bleaching. For this, use a potassium bichromate bleach, for instance Kodak R-9. Immerse the print and leave for about 30 seconds beyond the time required for the image to disappear. Then rinse for two or three minutes in running water. To remove the yellowish color, immerse in a solution of sodium sulphite—say 1 oz. sulphite to 10 oz. water. Turn the print over so both sides will be cleared. About a minute in this bath is usually enough. Again wash briefly.

At this point, you have developed the negative image and dissolved it away, leaving an undeveloped positive image. To get your final print, the silver bromide or chloride remaining in the emulsion must be converted into metallic silver. To do this, you simply develop the print again, using an ordinary diluted developer.

Then wash in running water for at least 10 minutes before drying. Or you can place the print in hypo for several minutes. This sometimes increases the brilliancy. Wash for half an hour to remove the hypo. END

Lost Vitamins

IF YOU must squeeze the orange juice the night before, be sure to stopper it well. If exposed, oxygen from the air will destroy some of the vitamins that form its chief dietary value.

Laundry in Deep Freeze

THAT frosty air that freezes your clothes to the clothesline frequently seems to bleach them whiter. This effect is probably due to the formation of ozone or hydrogen peroxide, which are more stable at lower temperatures. Both are excellent bleaching agents.

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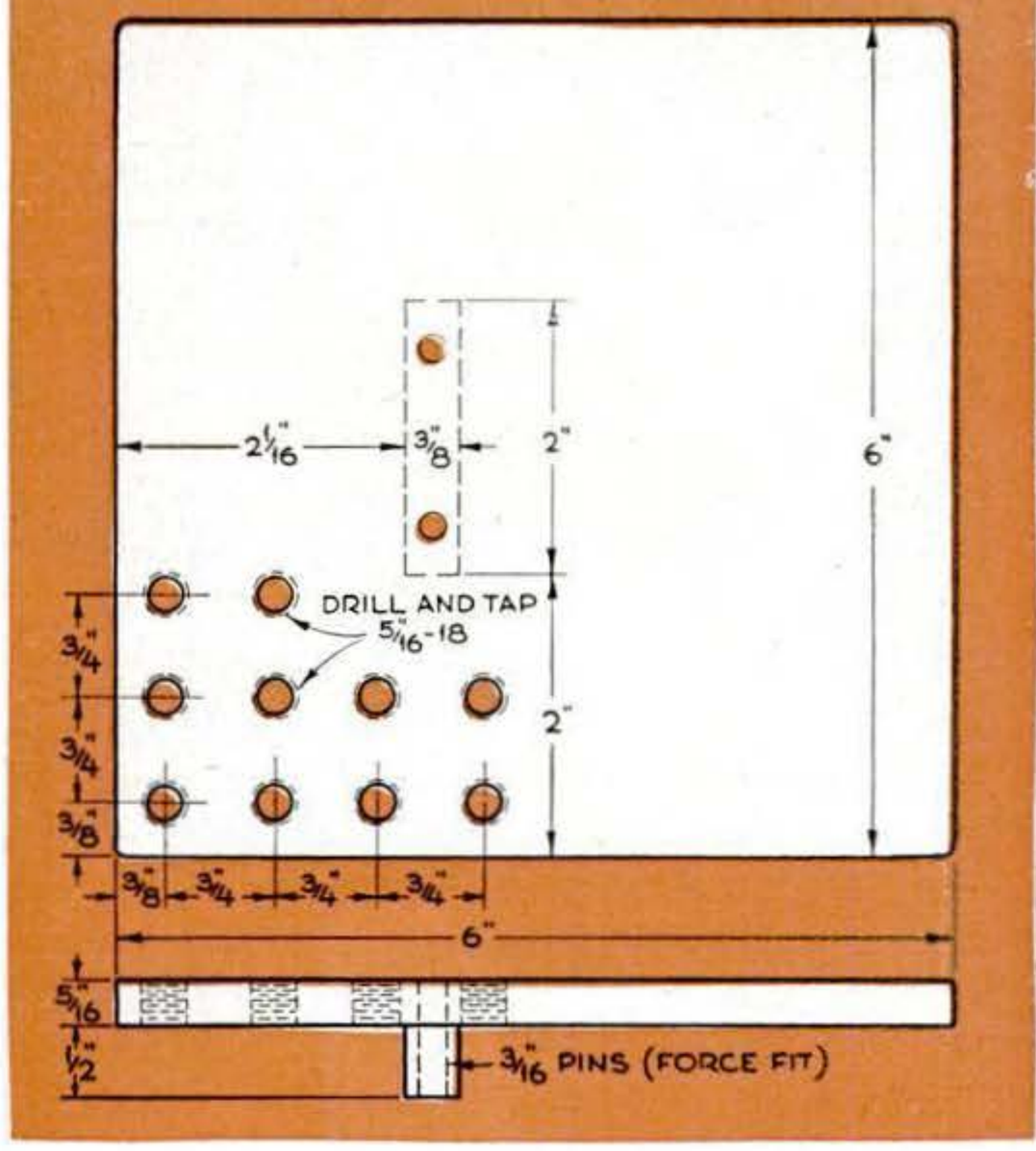
NEW SHOP IDEAS



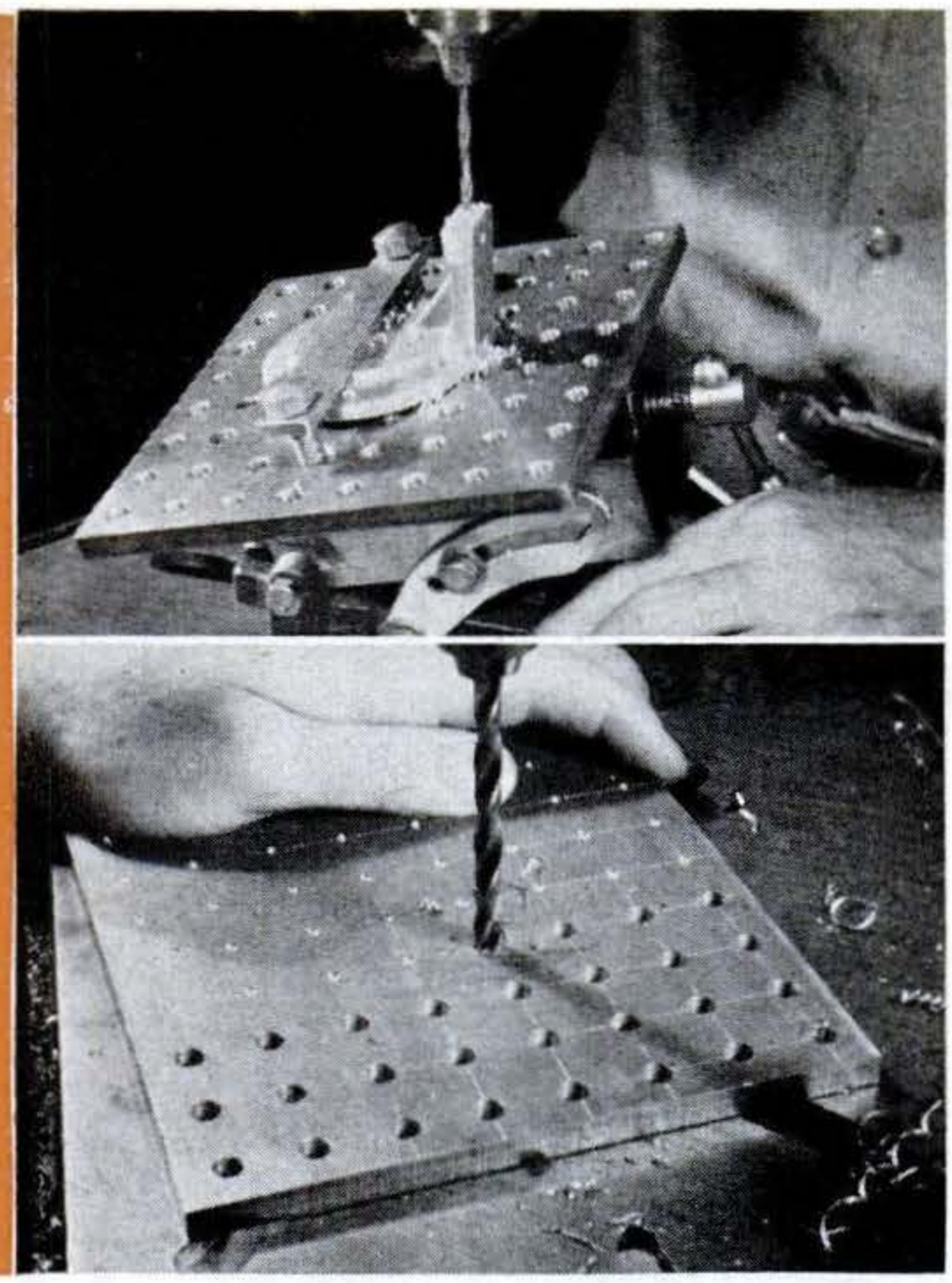
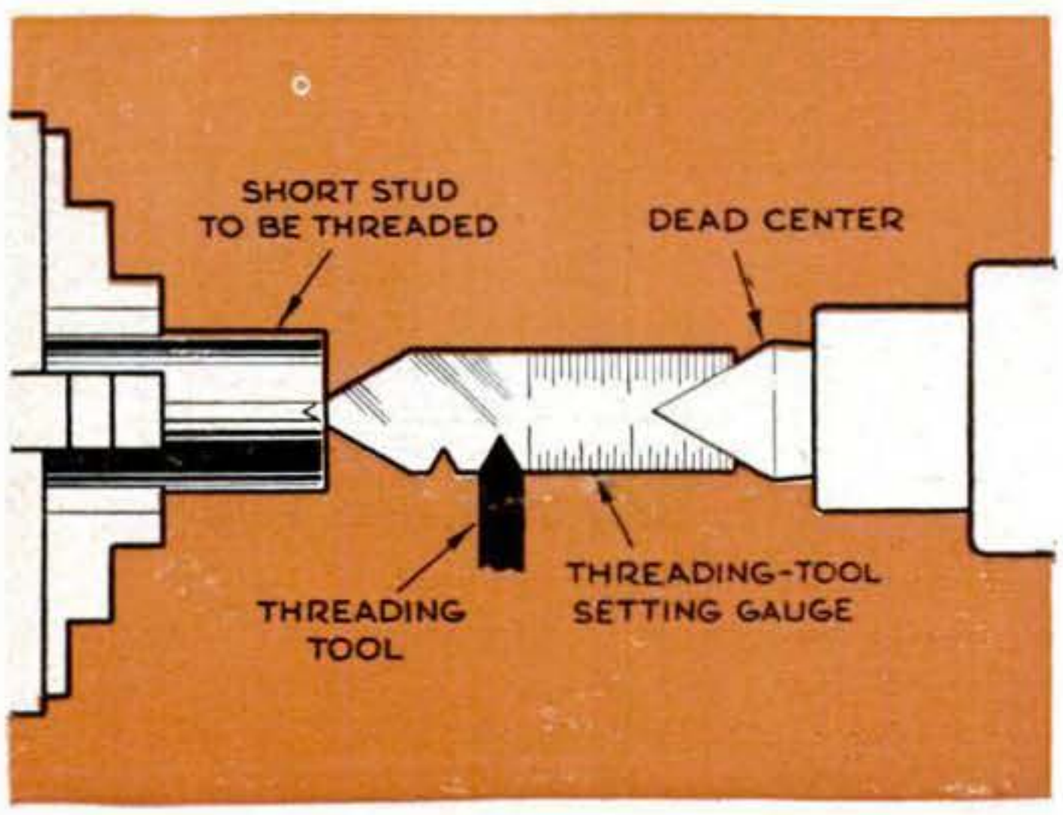
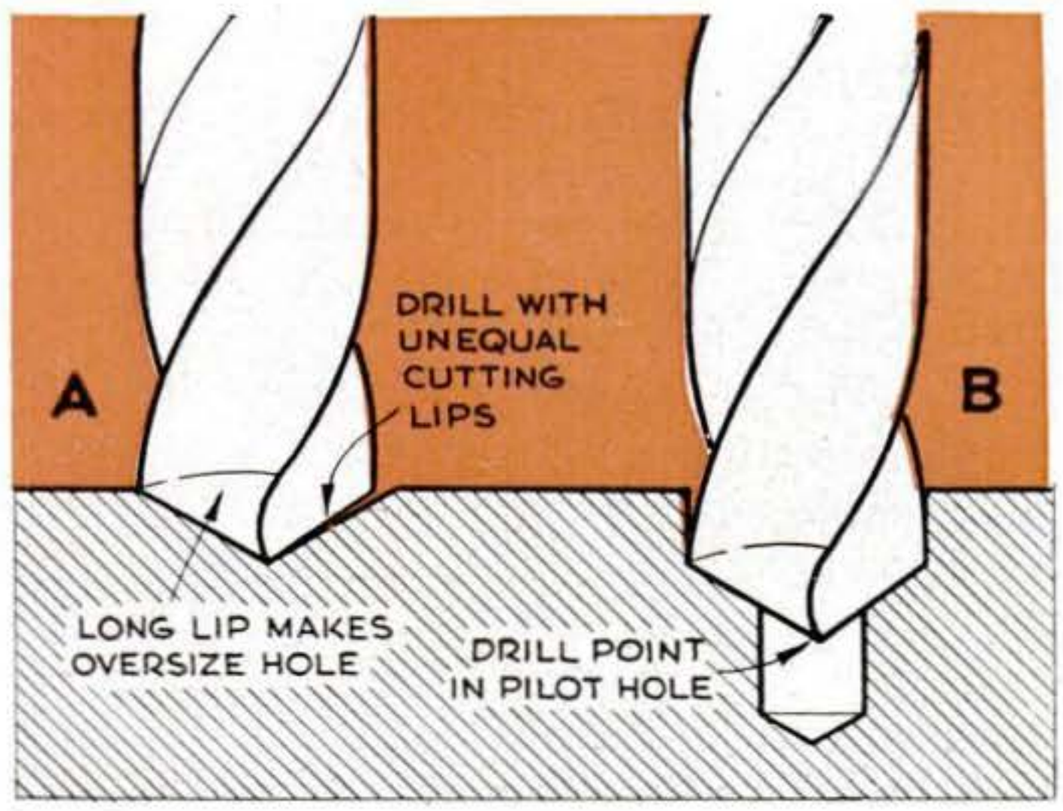


Plate Holds Odd-Shaped Work. Any work of irregular shape poses a problem when you try to clamp it in a drill-press angle vise. This fixture plate takes over nicely. You need only clamp the plate in the vise and hold the work with straps or stops fixed to the plate by screws. See the top photo at right above.

The drawing gives dimensions for a good general-purpose plate, but these can be varied to fit special situations. Cut the plate from cold-rolled steel and mill it square. Then drill, as above, and tap. Square a ⅜" by ½" by 2" piece, clamp under the plate, and drill both for drive-fit pins.—*Will Thomas, Kenmore, N. Y.*





Threading a Short Stud. When the work is shorter than the threading gauge, it's hard to set the tool. I do it by placing the pointed end of the gauge in the work center and the notched end in line with the tailstock center and level with the lathe bed. Then I set the threading tool in the side notch.—*A. Bogossion, Brooklyn, N.Y.*

Drilling Hole to Exact Size. If a drill isn't precisely ground so the tip is exactly centered, you often get a hole bigger than the drill itself. Drawing A shows why. To overcome this, first drill a smaller pilot hole. With this as guide, as at B, the drill won't run off center and enlarge the hole. —*F. Strasser, Santiago, Chile.*

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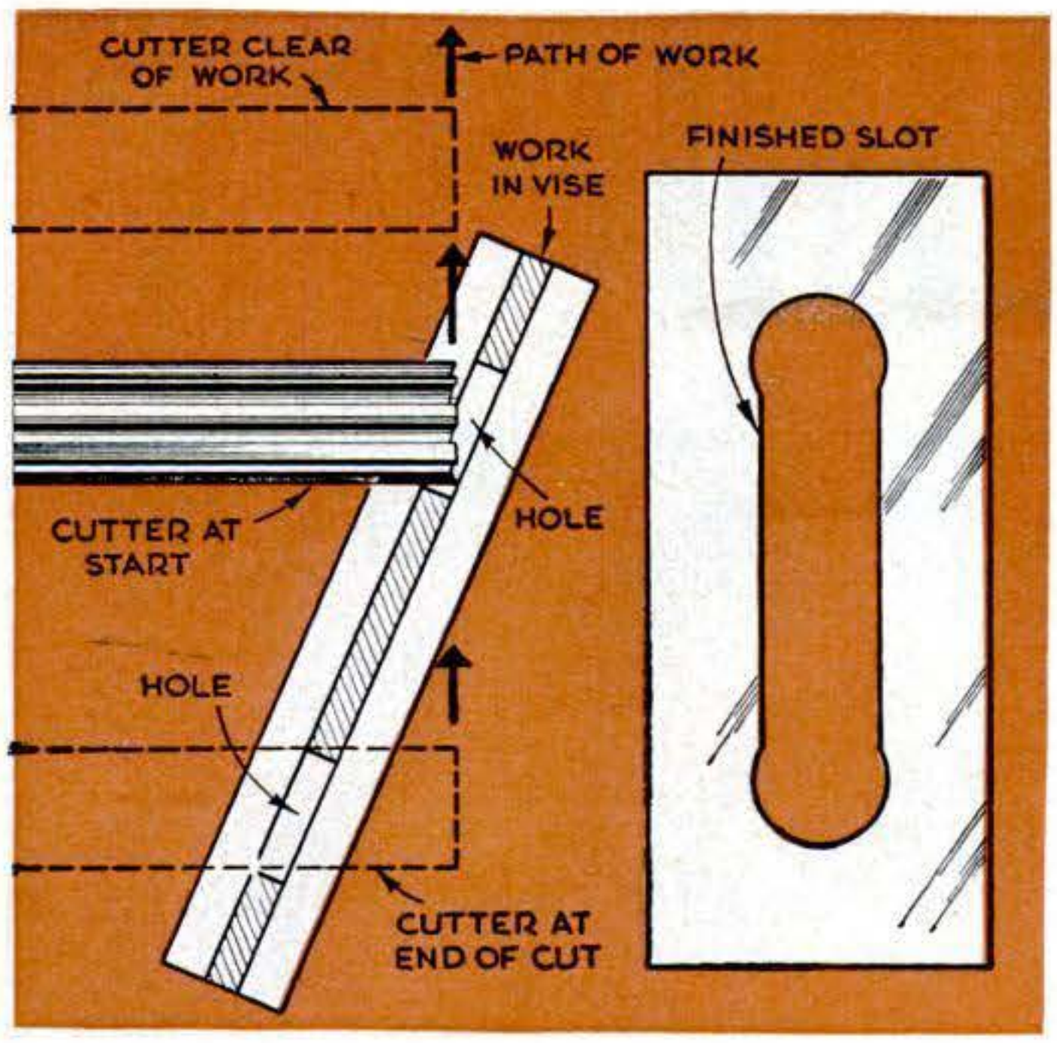
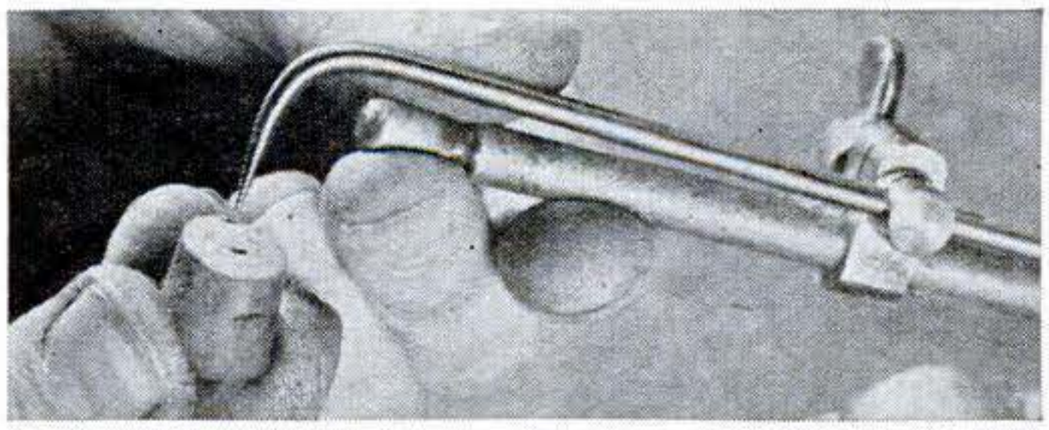
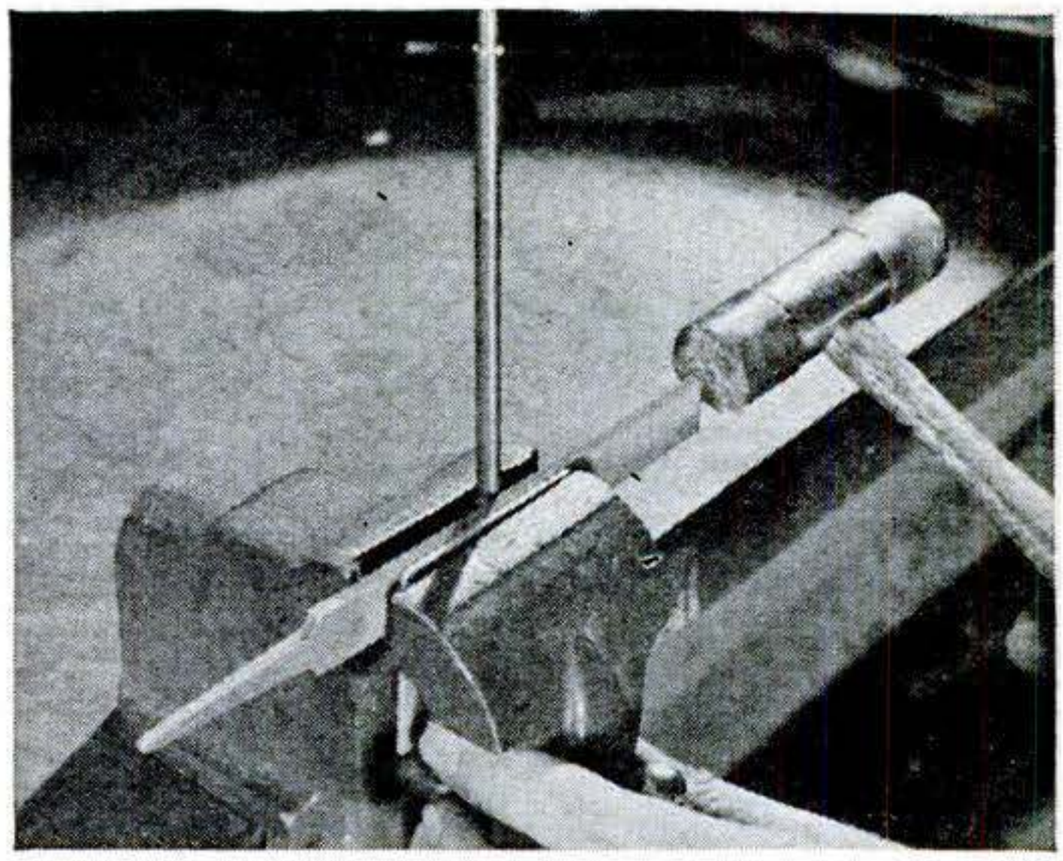


Angle Setup Shortens Cut. I had to mill the metal between two holes in some repeat work, producing the slot shown above at right. I started to set up the vise at right angles to the cutter, but soon realized it'd be smarter to set the work at the angle shown in the top view above. This way the two operations of moving the work onto and off the cutter are eliminated, the travel involved in each pass is shorter, and the cutter is less apt to chew into the ends. —*Harry Moore, Hamilton, Ont.*

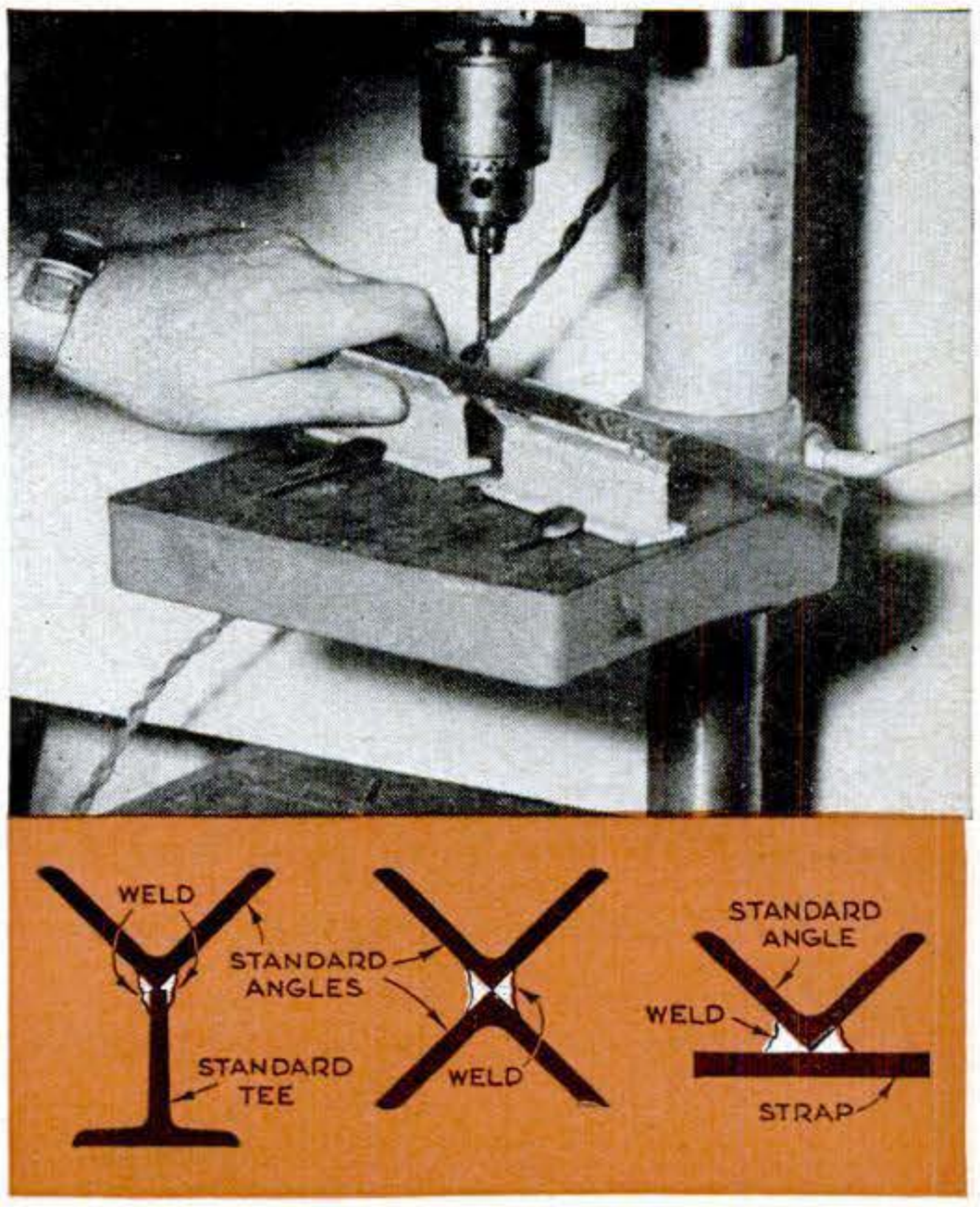
Mark Files for Metals. Ideally, a file should always be used for only one kind of metal. However, that would mean keeping too many on hand. As a substitute, mark one side of each new file and then use this side exclusively for soft metals such as copper, brass, and bronze. Reserve the other for steel and iron.



Oiled Cork Protects Points. An oil-soaked cork makes a good protector for a sharp point or edge of a tool. A penetrating type of oil or a thin lubricating oil can be used. It's a good idea to keep several corks in a jar of oil so one will be available when needed. The oil in the cork reduces the danger of rust.



Knurling with a File. A rod made of aluminum, brass, or other soft material can be knurled lightly with a file used as above. Sandwich the rod between a sheet of soft metal and the file. Then clamp the assembly in a vise. Hammer one end of the file so it is moved endwise, forcing the rod to roll along its surface. Soft sheet metal between the file and vise jaw will help protect the file.



Convenient Work Holders. Many standard forms of light structural steel—for example straps, tees, and angles—can be easily welded into blocks for holding round work while you are drilling, welding, or performing other operations. Make the blocks in pairs. The drawing shows some possibilities.—*Evan Wright, Topeka, Kan.*

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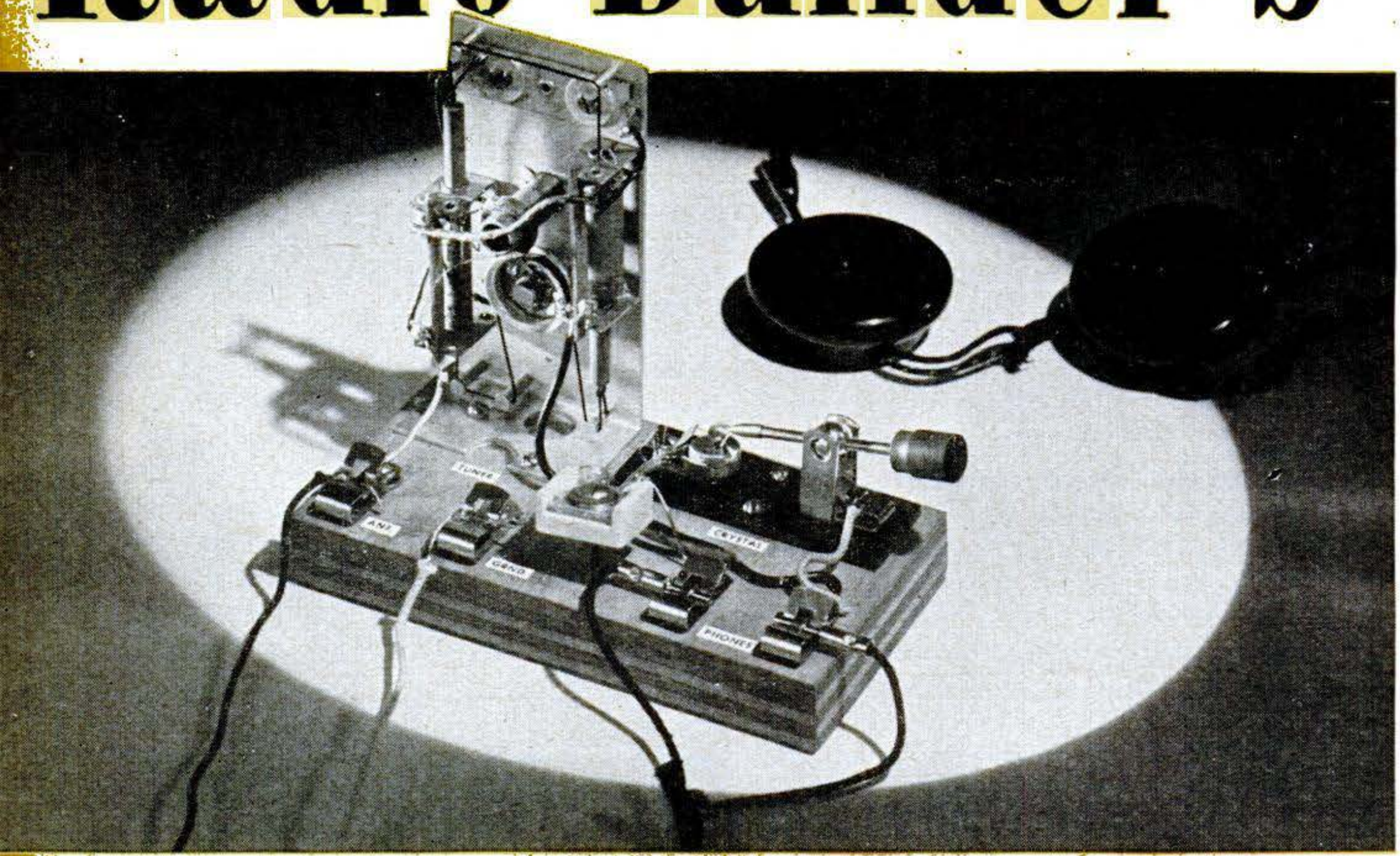
Radio Builder's



Crystal Kit

Remember the sets you built when you were a kid?
You can encourage your boy to build one with these parts.

NEXT time you're looking around for a gift for a small boy, hop down to the radio store and pick up the inexpensive components shown in the picture at the top of the next page. Put them together in a gift box. Paste an attractive cover on it (like the heading above). Enclose a sheet of directions such as you'll find on page 224. Then let the youngster have the fun of assembling his own radio.

The set shown here is an up-to-date version of those with coils wound on oatmeal boxes that you probably made as a boy. It has a permeability tuner that changes stations by sliding a powdered-iron core in and out of a coil.

If you select units that look like those in the photo, it will be easy for a boy to identify them. Lay all of the parts out on the baseboard and punch starting

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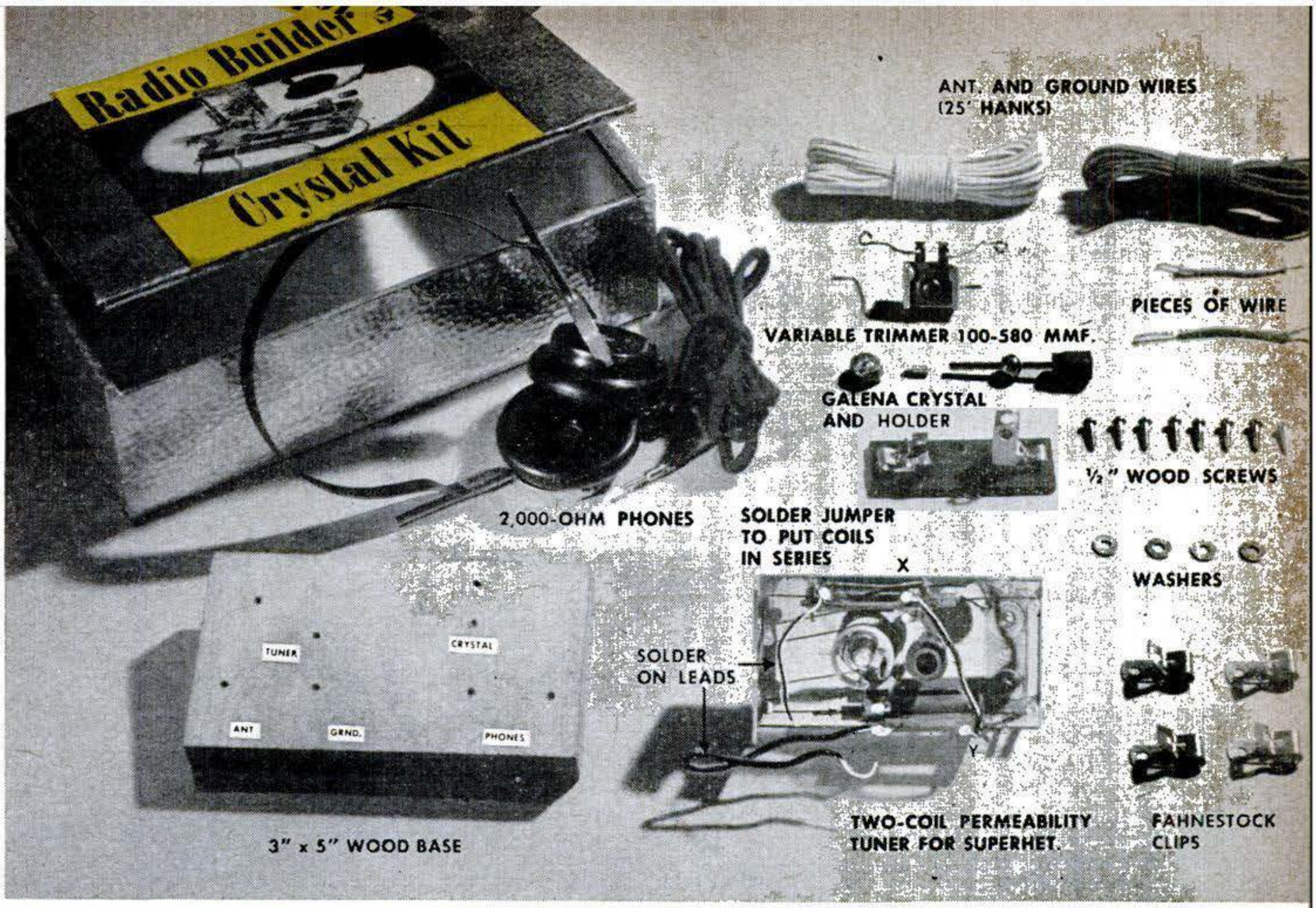


These parts can be used by a boy of 10 to build the radio shown in the photo on the dressed-up cigar-box lid. The instructions for assembling the set can be pasted inside the box (below).

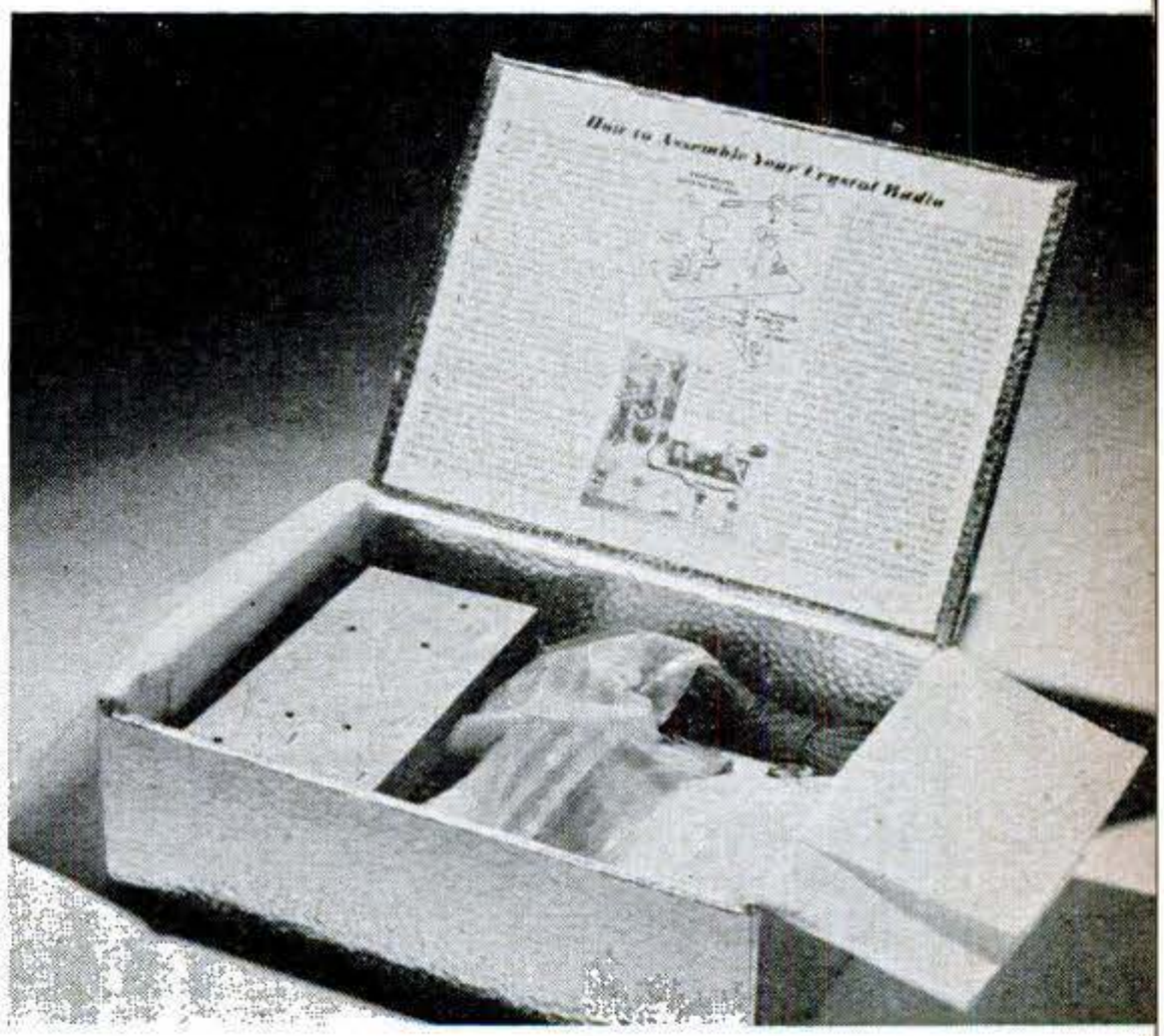
holes for the screws. Then print or paste labels to the board to mark each item.

The tuner is made for superhets, so you'll have to put the two coils in series. Solder a connection between X and Y, taking care not to disturb the delicate leads from the coils to the soldering lugs. Any permeability tuner of the kind shown will serve when the coils are connected in series. The one pictured is manufacturer's surplus and cost $1.

To eliminate all soldering operations for the junior builder, you'll probably want to attach wires to lugs A and B. Leave these long enough to reach the antenna and phone clips. While the iron is hot, you can also connect short wires to the trimmer-condenser terminals.

For the connections in the set, solid push-back wire is probably the best. The antenna and ground wires should be stranded. You can make it a little easier for the builder by tinning the tips so the wires won't come unstranded.

It'll also help if you caution him not to touch the fine leads in the tuner, and not to finger the galena crystal. (A crystal dirtied by handling can be cleaned with carbon tetrachloride.) If you're far enough away from



a transmitter to need an outdoor antenna (say 15 miles or more) and if you don't already have one, you'd better add some antenna insulators and a lead-in strip to the kit.

Decorate a cigar box in a way that will appeal to a boy, paste on a sheet of instructions, and wrap the parts. The box shown was covered with heavy gift paper held on with rubber cement.

Labels such as those printed below can be pasted on the base to make assembling easy for him.

TUNER CRYSTAL ANT. GRND. PHONES

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How to Assemble Your Crystal Radio

1. Fasten the part marked TUNER to the board with one or two screws.

2. Place one of the four loose clips on the board at the point marked ANT (antenna). Connect the wire from point A under the screw that holds this clip. Loop the wire around the screw and under a washer as shown in the sketch. Whenever you make a connection, remember to cut off a small amount of insulation so that the contact is made on clean, bare wire.

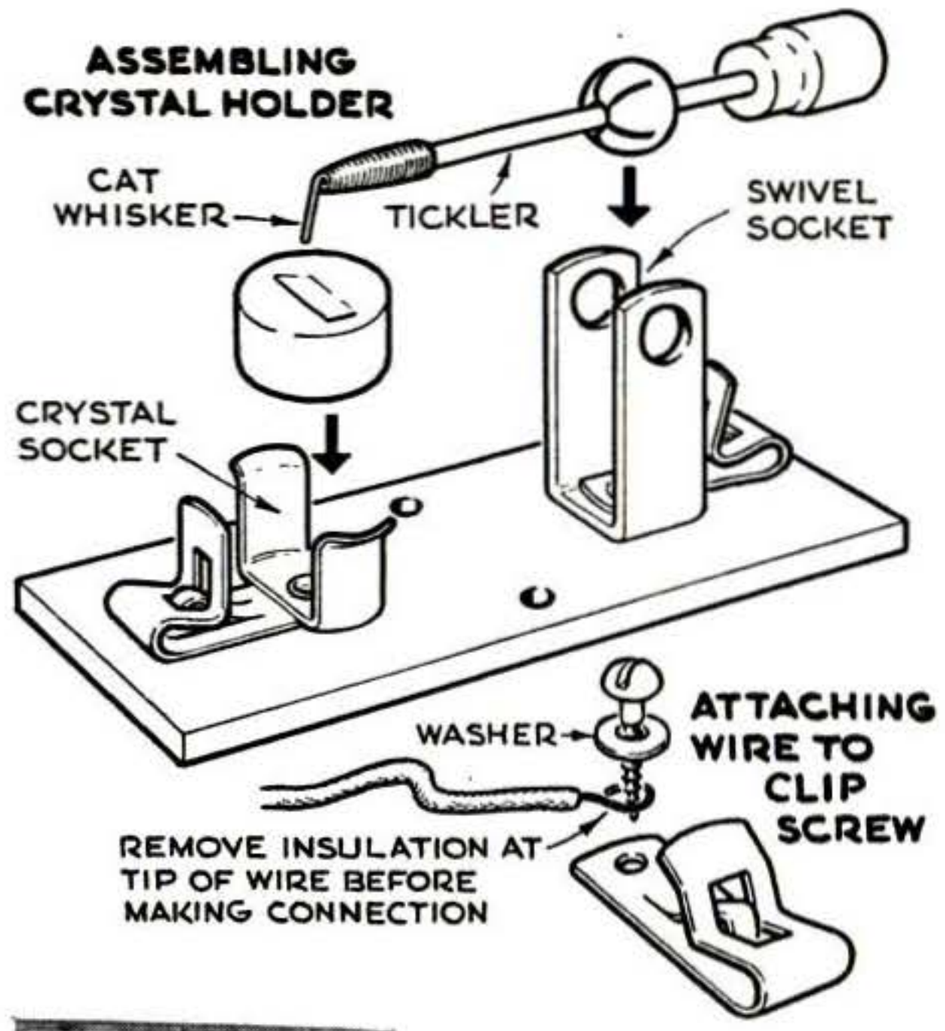
3. Place the trimmer condenser loosely on the board at the place shown. Make a loop in one of the wires soldered to it. Place the GRND (ground) clip in position and screw it in place, fastening the trimmer wire under the screw as you do so.

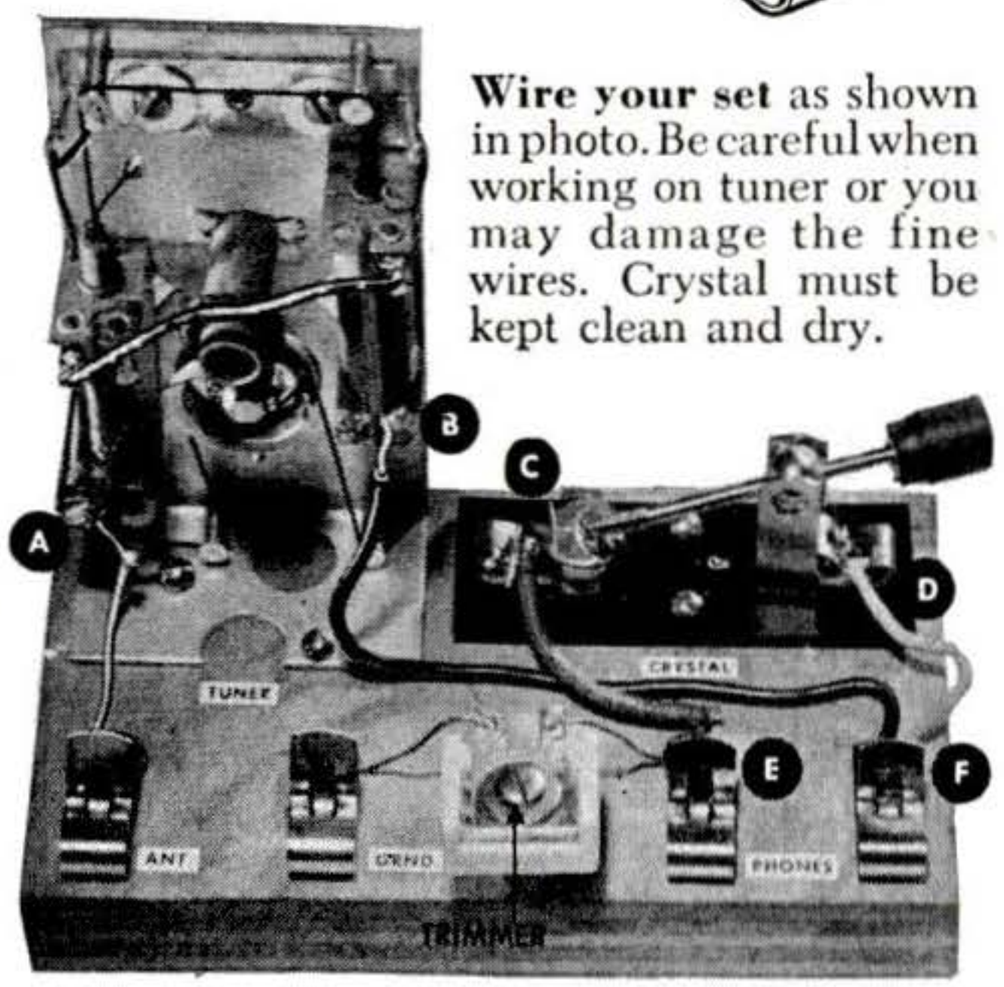
4. Fasten the crystal holder to the board with two screws. Your holder may look a little different, but it will work the same.

5. Take one of the short pieces of loose wire in the box and slip one end under the crystal-holder clip C. You may have to bend the clip in order to get the crystal into the socket in front of this clip.

6. The other end of this wire goes under the screw and washer holding phone clip E. The wire from the other end of the trimmer is attached to the same screw.

7. Slip another loose wire under crystal clip D, and connect the other end to phone clip F. The wire that comes from the point on the tuner marked B is attached to the same screw. The wiring of the set is now complete.





Wire your set as shown in photo. Be careful when working on tuner or you may damage the fine wires. Crystal must be kept clean and dry.

To operate your crystal receiver, assemble the parts of the crystal holder: The galena crystal provided with this kit is embedded in a small disk. Press it down between the two upright arms at C, taking care not to touch the galena itself with your fingers. A rotating arm on a ball-and-swivel goes between the uprights at D. These, too, may have to be bent to make them hold the swivel ball tightly. A tiny spring slips over the tip of the rod. This is the "cat whisker." You use it to find a "hot" spot on the face of the crystal. Move the tickler arm by the knob in order to get the cat whisker to touch the crystal. You may have to try several spots before you find the best one.

Connect the headphones by inserting the jacks in clips E and F. Unwind one of the long hanks of wire and connect one end under the ANT clip. Drop the other end out a window or connect it to a bed spring. Use the other hank of wire to make a connection between the GRND clip and a water pipe or radiator. Scrape a clean, bare spot on the pipe so the wire will make good contact.

Tune the set slowly by turning the knob on the front of the tuner. If you don't hear anything, jiggle the cat whisker to see if you can find a more sensitive spot on the crystal. With a screwdriver, carefully and slowly turn the trimmer screw. Move it about a half turn at a time and repeat the tuning operation. Once the trimmer is set for best results, you don't have to touch it again.

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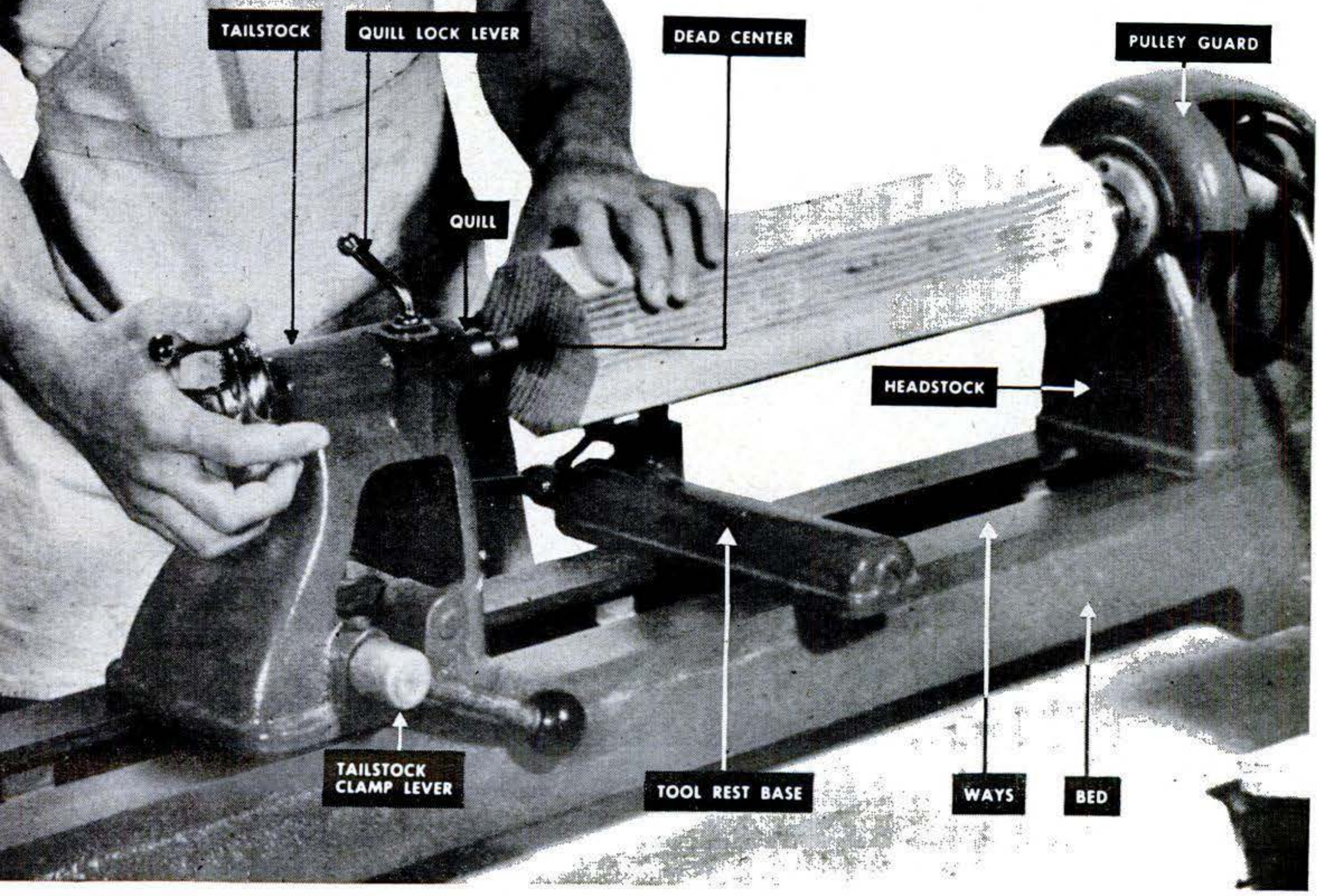
How to Turn Spindles

POPULAR SCIENCE'S expert explains the first steps in the gratifying hobby of wood turning.

By Edwin M. Love

WOOD turning is so fascinating that kings have made it their hobby; and no wonder, for no other machine work is so responsive to the whim of the craftsman. Under the chisel the whirling wood is molded like clay on the potter's wheel, and only imagination limits the forms that can be evolved. Table legs, lamp bases, bowls, and candlesticks shaped in countless designs are but a few of the items to be made with a lathe.

One intriguing possibility is turning a rough billet, perhaps cut from the limb of a tree or a gnarled piece of wood, into a beautifully grained and distinctive article.



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You can center the stock by drawing diagonal lines on the ends when your lumber is square, or by striking arcs with hermaphrodite calipers when you have round stock. If the stock is lop-sided, the center can be found by laying it on a bench and scribing the ends with a compass as shown at the right. A kerf helps the live center bite into the stock to drive it.

Column-like turnings are called spindles. The first step in making them is to convert the wood into a cylinder. Rough stock can be preferable to smooth lumber because it is less expensive and a larger diameter for a given piece is possible. Inspect the piece before you begin for checks or loose fragments, and be sure the wood is well seasoned.

Live and Dead Centers

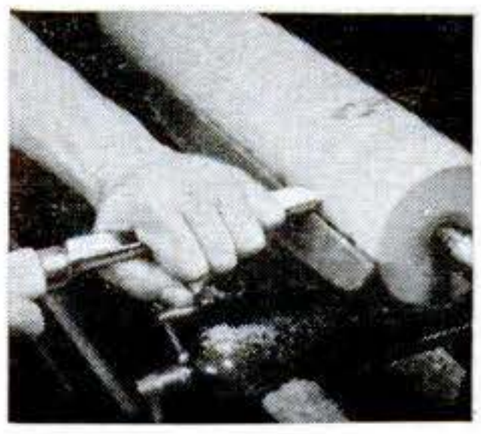
The work is carried on a live (rotating) center at the headstock and a dead center at the other end. Many centers have tapered shanks that fit into the hollow spindle of the headstock and the quill of the tailstock, although some centers are bored to fit over, instead of into, these parts.

Rough turning will be easier and safer if you first knock off the corners of the work with a bandsaw or even a hatchet.

Just in case you might want to remove the work from the lathe before turning is completed, file a notch in one spur of the live center and mark the end of the wood to correspond. You can return it to the same position then, with assurance that it will be truly centered. Drive the centers into the work, or set the live-center spurs into saw cuts. Lubricate the dead center with oil or, if the stain is objectionable, fill the cupped end with paraffin or other solid lubricant.

Be Sure Tool Rest Clears

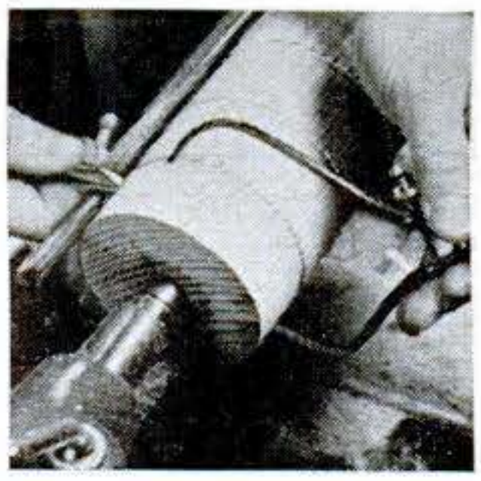
The photo on the preceding page shows the method of mounting the work in the lathe. Slide up the tailstock, lock it, and screw out the quill with enough pressure to hold the work firmly without binding. Set the tool rest as close to the work as clearance will allow, turning the lathe by hand to test it. Then belt the machine for roughing at slow speed, and stand aside when starting it to avoid being struck if by some chance the piece should be thrown off.



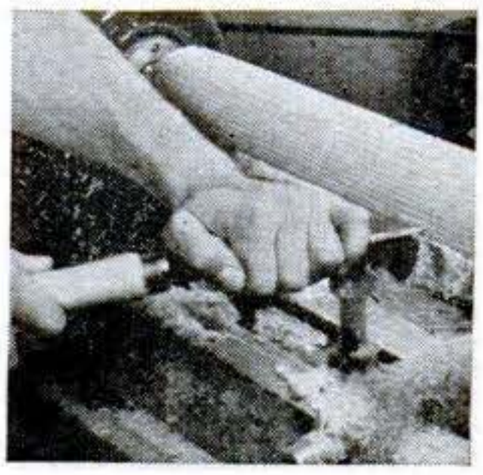
Take an easy position that permits you to sway from side to side. Rest the large gouge on the tool rest with the point raised, and swing the handle up until the edge cuts.

Make a series of cuts 2″ or 3″ apart to divide the waste stock so there will be no long splinters to fly, then work down the piece by sliding the tool along the rest. Such scraping cuts are easy to manage and can be taken by the most inexperienced person, but be sure to grasp the chisel firmly and hold it solidly against the tool rest.

Use calipers to gauge the diameter of the work. Set them 1/16″ oversize for smoothing later and make sizing cuts, running in until the calipers snap over the cut. Stop the lathe for best accuracy, but rough measurements can be made as it runs.

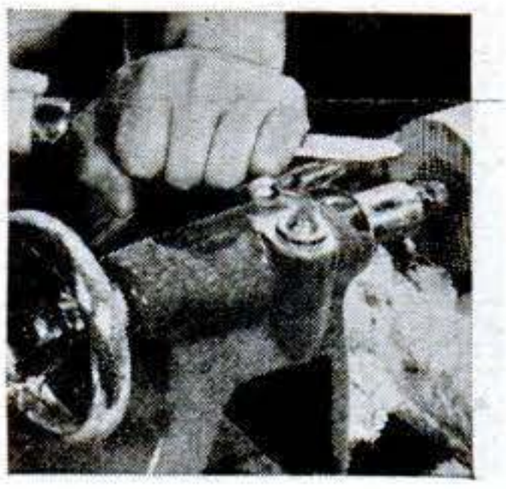


Turn the cylinder straight nearly as deep as the sizing cuts; then smooth it with a skew —the chisel with the diagonal cutting edge —laid flat on the tool rest.



Square the ends by cutting to length with a parting tool and scraping them smooth with either the skew or the diamond-shaped chisel.

The photos show you how to hold the tools while doing this.



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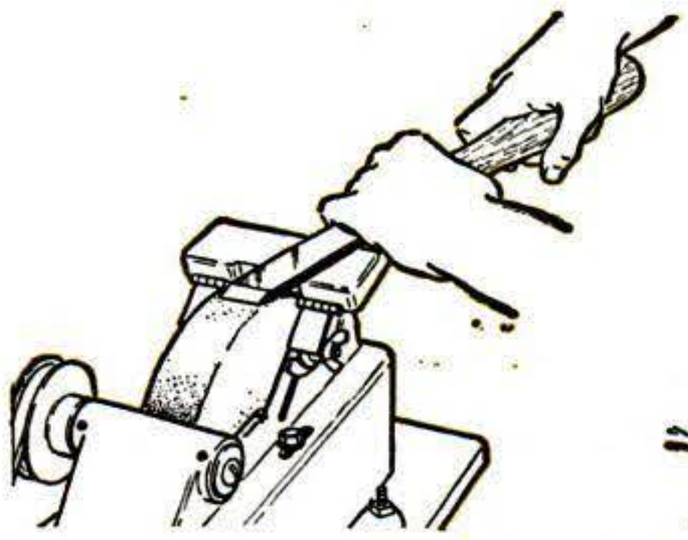
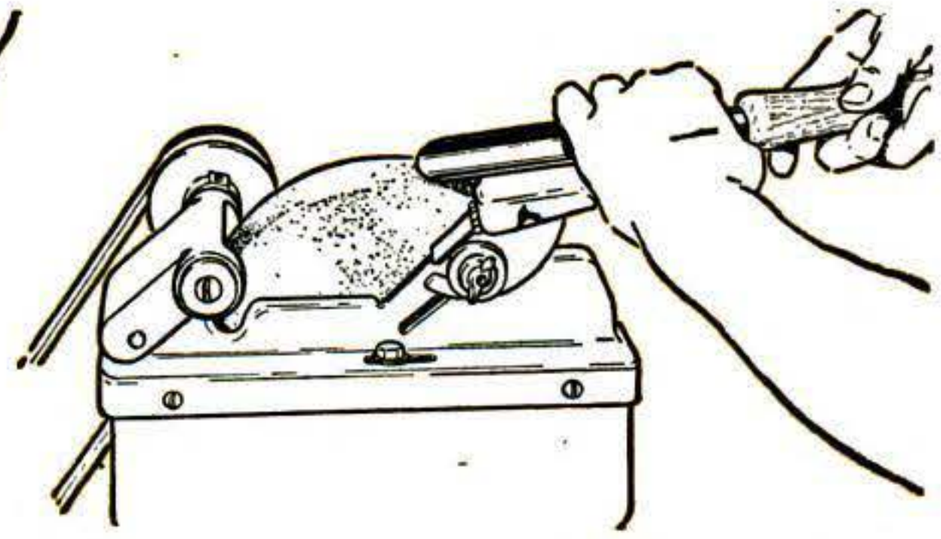
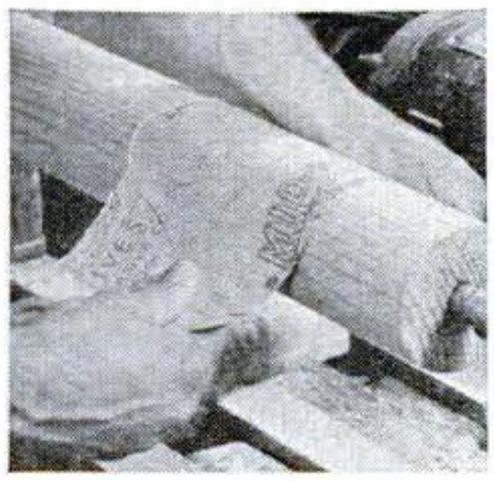




To sharpen the gouge, hold it steady in one hand and rub the slip stone evenly over the bevel. Then remove the wire edge by rubbing the round edge of the stone flat against the inside of the gouge. Frequent grinding will reduce whetting time. Roll the gouge evenly as shown above but grind the skew bevel flat or even slightly hollow.

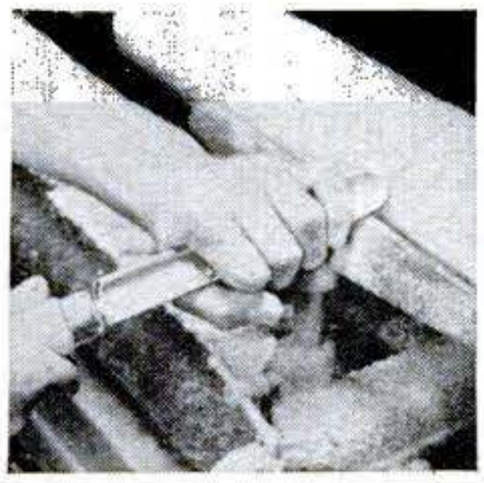
Marking the length is a cinch—just rest a scale on the tool rest and touch the revolving work at the proper points. If there is no surplus length, just smooth the ends directly.

A good procedure for lathe sanding is to start with No. 1 or 1½ grit and finish with 00. For fine work rub lengthwise of the grain as a last touch. Remove the tool rest to avoid the danger of your hands being thrown against it if the paper should grab. Note how it is being done at the right.

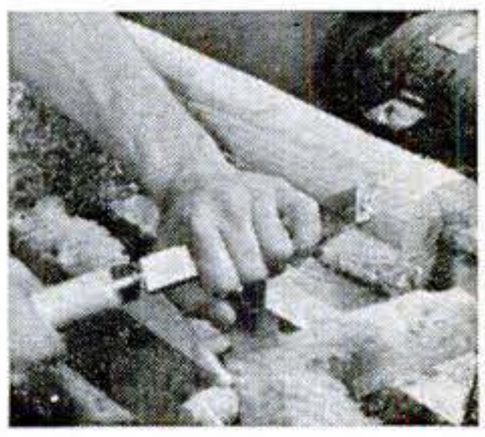


While scraping cuts are easy to learn and safe to use, shearing cuts should be mastered as they speed up turning processes and save much sanding. Cutting with the gouge is a three-step operation that merges into one with practice.

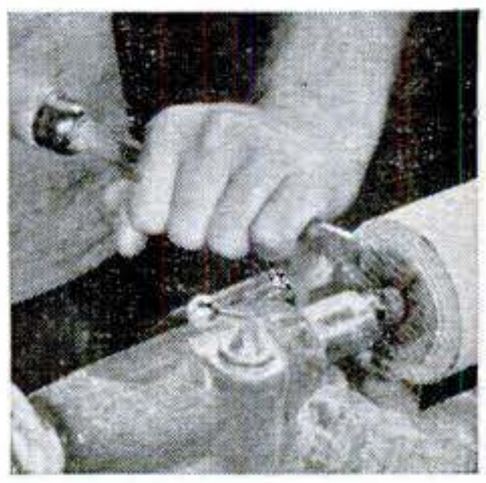
First, support the gouge on the tool rest with the handle well down and the bevel bearing lightly on the rotating work. Second, raise the handle until the edge begins to cut, at the same time swinging the handle a little away from the direction of motion. Third, roll the gouge in the direction of motion to throw the shavings to the side out of your way.



Cutting with the skew is rather difficult at first, but it yields a planed surface that is glossy and needs little sanding. Position the skew with the bevel resting on the work, draw it back until the edge begins cutting between the points, and keep the edge at an angle of about 40° with the axis of the work. Never allow the end point to engage—the penalty is a deep, spiraling gash that may ruin the piece. Always hold the skew tightly.

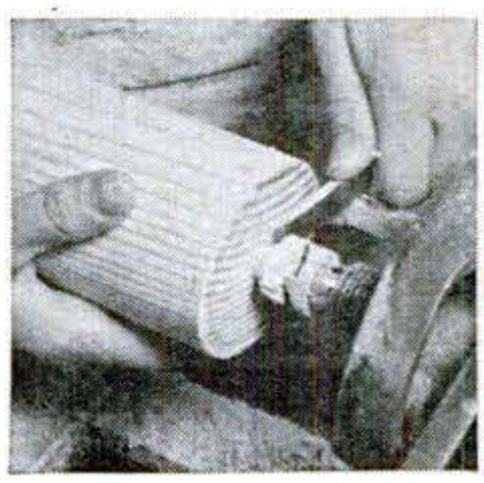


The next picture illustrates the cutting method of trimming the ends. The point of a narrow skew is lowered until it begins to cut, the bevel paralleling the end. Cutting in can be done with a skew, the point making an incision and the waste trimmed cone-shape by an angular cut.



To cut off work, run the skew in at the headstock end while the work revolves slowly until there is barely enough stock to support the piece. Then circle the work with one hand and finish cutting through with the skew.

The instant the work is severed, it falls into your hand. Never cut it off at the tail end, as the work might be thrown. The nubbin that is left can be trimmed flush and sanded by hand.



You can remove a live center by driving a dowel or a soft-metal rod through the headstock. The dead center is removed simply by backing off the tailstock wheel until the center is loosened and can be taken out of the tailstock ram.

Now turn the page and read how you can use these basic turning techniques.

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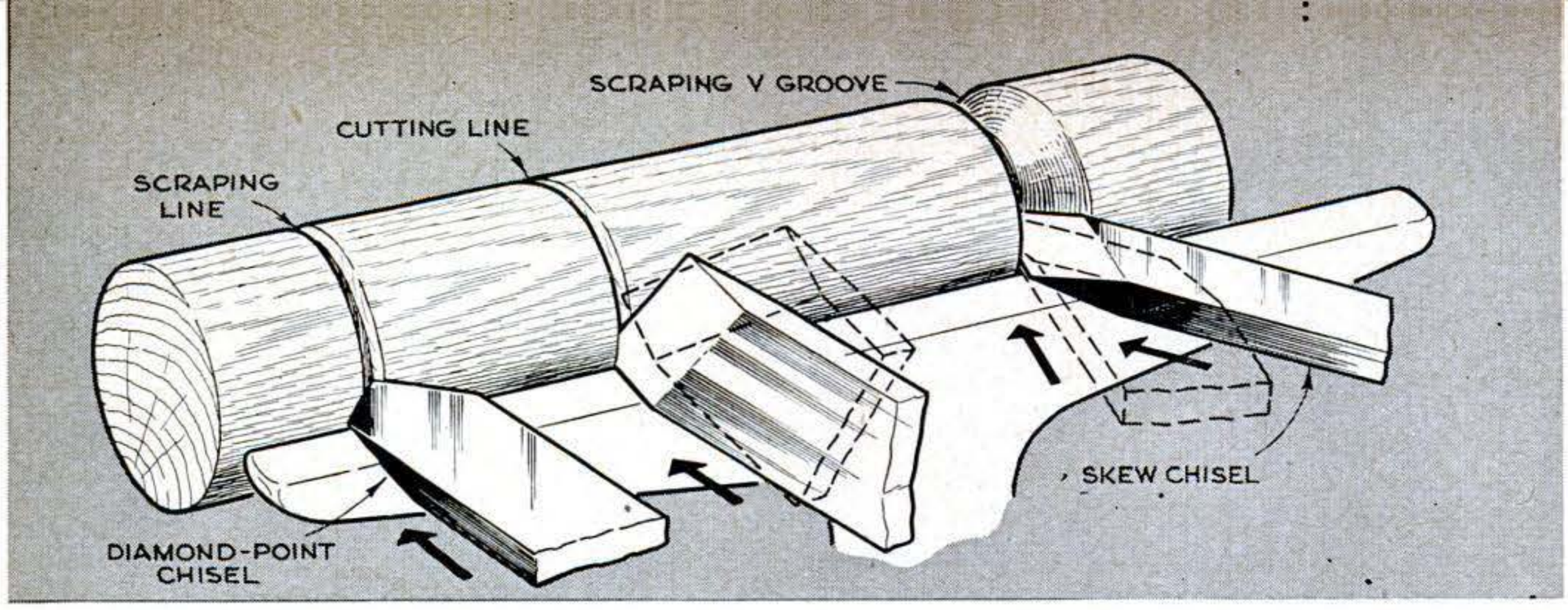


Now the Real Fun Begins...

Practice cutting the five elements of every design and see for yourself.

THE real fun of wood-turning comes when you are shaping your roughed cylinder to the chosen design. With the tool in your hand and the lathe whirring, you have the means of shaping a piece of wood as simply or as elaborately as you wish. Sometimes an experimental thrust or a trial cut dictated by the whim of the moment will turn a commonplace thing into something distinctive in character.

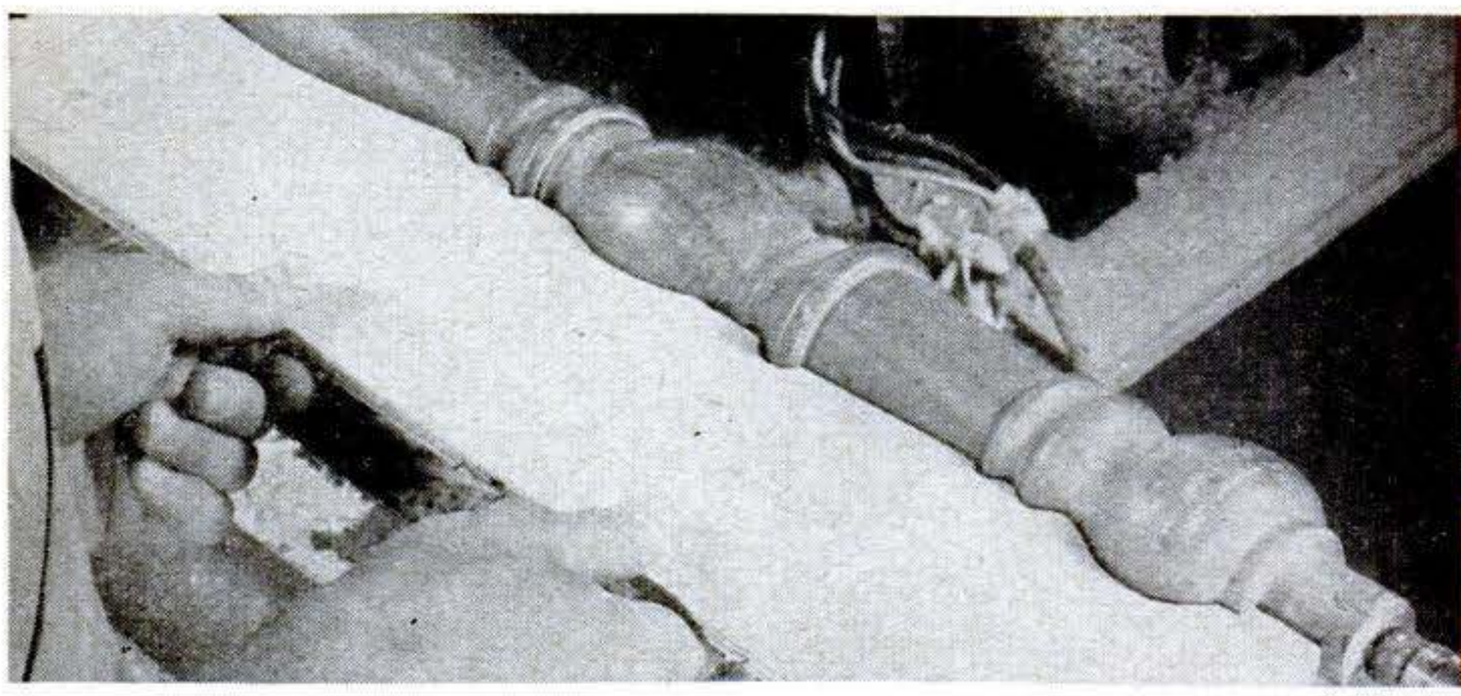
All spindle turning is made up of combinations of five simple elements:

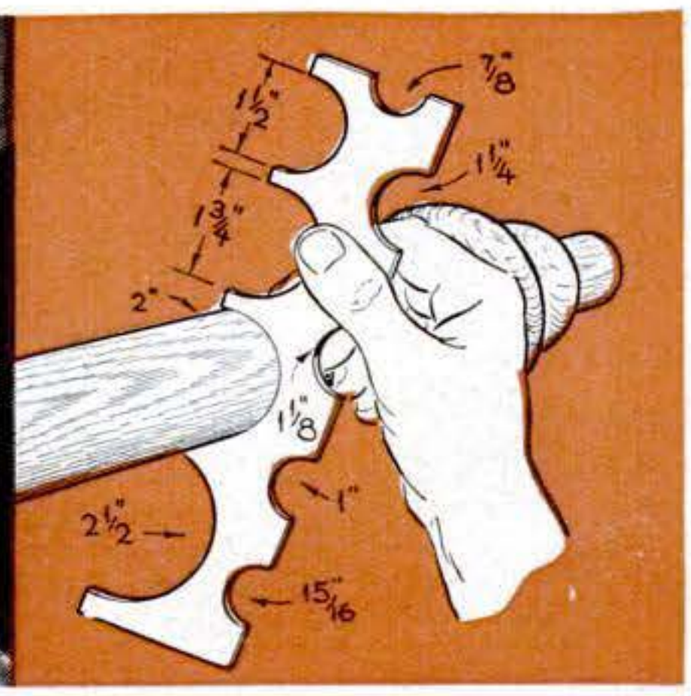
1. The line,
2. The cylinder,
3. The cone,
4. The bead, and
5. The cove.

Take a little time to practice cutting these units and you'll find yourself equipped to do a creditable job of turning, no matter what the design; and there's nothing irksome about this practice.

Line: The simplest ornament is an incised line. Set the tool rest about level with the lathe center, touch a lead pencil against the revolving work, and rest the skew on edge, the long point down and the handle lowered. Lift the handle until the lowered point digs in, and there's your line. A shallower line results when the stock is scraped with a diamond-point chisel laid flat on the tool rest, as shown above.

Enlarged, the line becomes a V groove. Unless your eye is good, you'd better mark the width with the pencil. Scraping with the diamond-point thrust straight in reproduces the angle of the point, which is handy on repeated grooves. As the tool comes, this angle is rather blunt, and you may want to grind a sharper angle—say 90° or 80°, which will also enable the chisel to work in close quarters when scraping ends of spin-





Templates are useful when you must make identical turnings, such as table legs. You can scrollsaw one like this from thin plywood. The spacing of the different sections was marked on the straight edge of this one with brads. By pressing the edge having the sharp brads against the rough-turned rotating piece, all divisions can be marked at once. If you do much turning, time in setting the calipers can be saved by cutting out a diameter gauge, too. The sketch at the right shows one that will provide most commonly required diameters.

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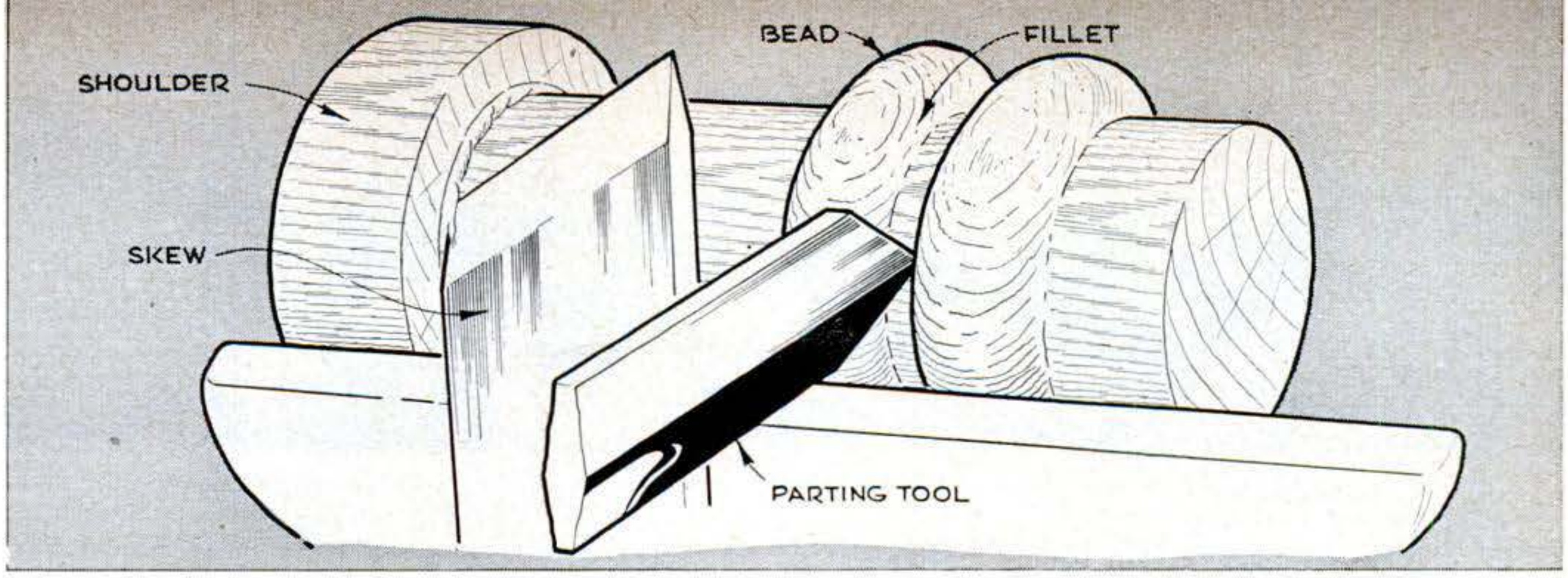
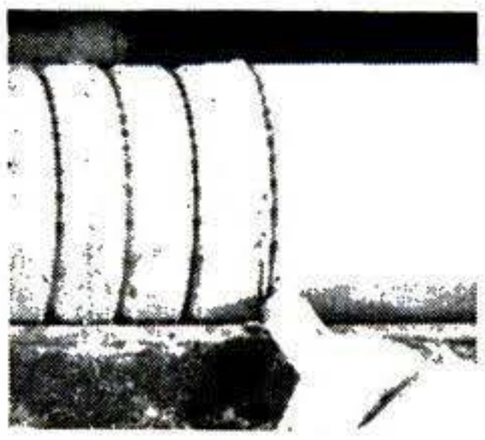


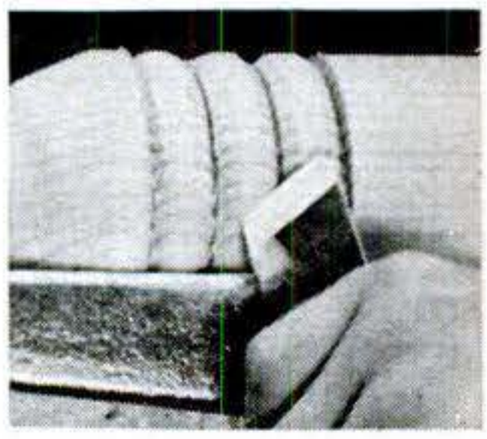
dles or shoulders. Of course, a scraped V groove can be blunted by swinging the handle from right to left, care being taken to prevent scoring opposite sides with the point.



You'll get a smoother cut with the skew chisel held as for making a line, but thrust in with the outer bevel parallel to the side of the cut. The V is complete in two cuts.

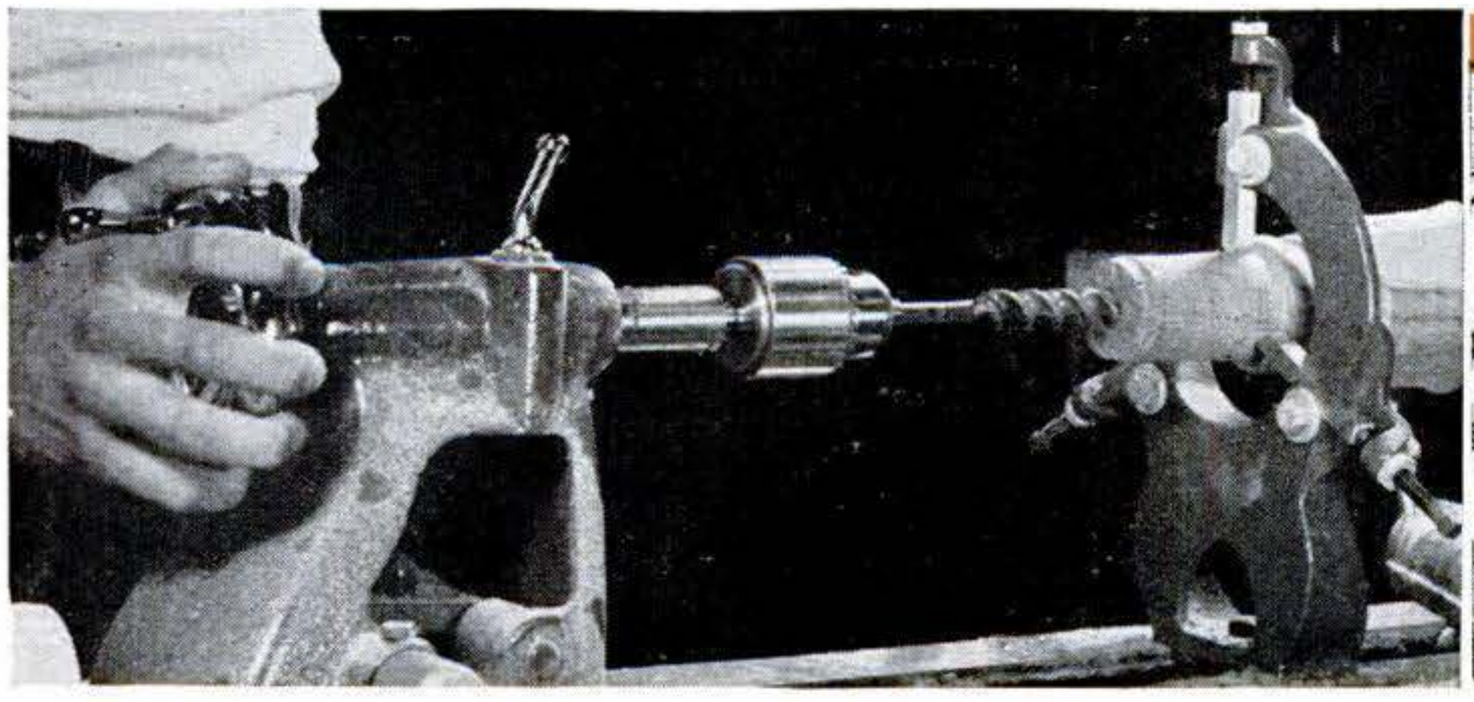
Cone: Turning a cone is like turning a cylinder. There's an advantage in that mostly it can be cut toward the small end, which enables the tool to work with the grain, eliminating chipping. If there's a shoulder, score deeply with the point of the skew and work up into the angle with the heel of the tool, rather than the center of the edge. Finish the shoulder end as you'd square the end of a cylinder.

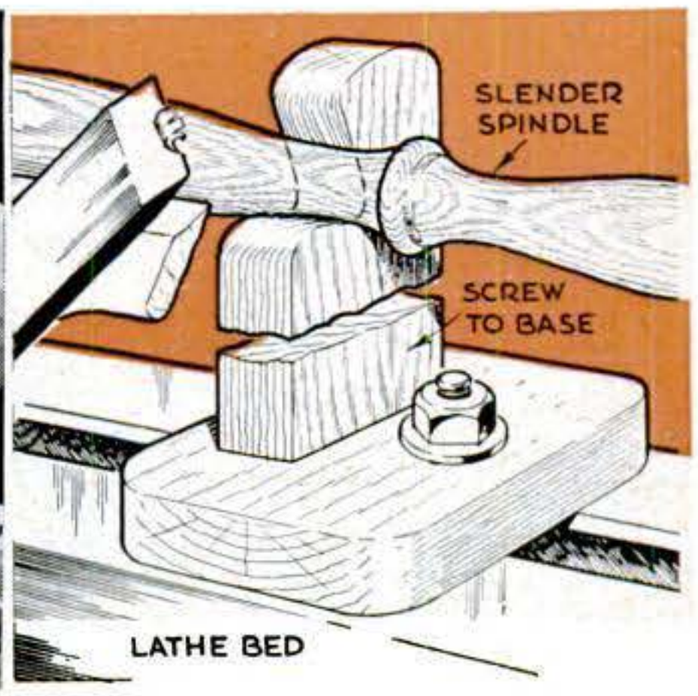
Bead: A bead is a tricky number, and your first will probably be more triangular than round; but you'll get the hang of it in two or three trials. Score the sides with the skew point. You can scrape it with a skew held flat, first chamfering the corners and then swinging an arc to shape the semicircular profile.



In using the shearing method (right), begin with the skew held nearly flat on the tool rest and roll it up onto its edge, at the same time swinging the handle toward your body. This gives the round outline of a bead.

The cutting is done with the heel of the chisel. You can make the cut left- or right-handed, or by holding the blade in the left hand for the whole job; but grip it firmly, or the edge will catch and spiral back into the bead. You don't have to become expert before turning a bead on finished work, for at lathe speeds sandpaper is a cutting tool, and you can literally wipe off corners and rough spots with a piece of folded sandpaper. Hold it on the far side of the work, where the hand will be thrown upward, rather than against the bed of the lathe if, by chance, the paper should catch.





A steady rest is used when a hole must be bored in the end. Back the fingers against a bead or shoulder to hold the work on the live center, and adjust them to bear lightly against the work, then clamp them firmly. For a small hole, turn a dimple for centering first, and drill it with a bit in the tailstock. Large holes are scraped with a skew chisel. A steady rest or home-made "base stick" (shown at right) can also be used to keep a long slender piece from chattering, or for turning finials on the unsupported end of the rotating work.

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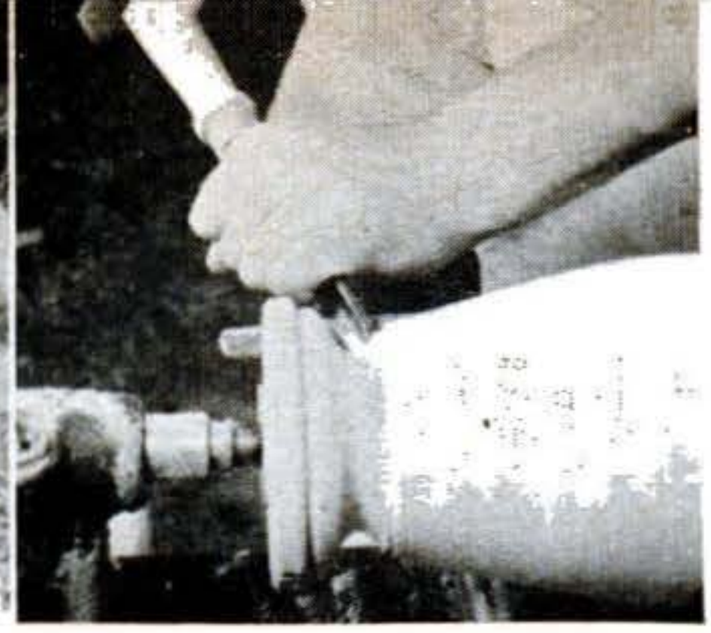
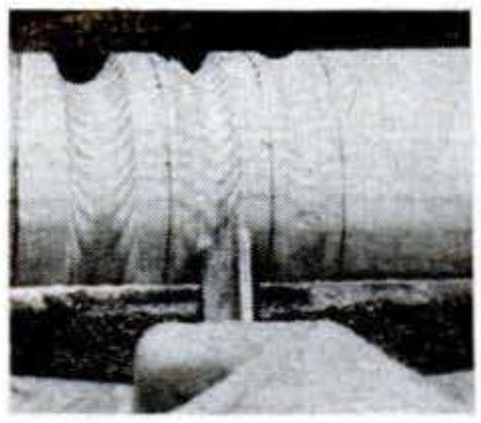
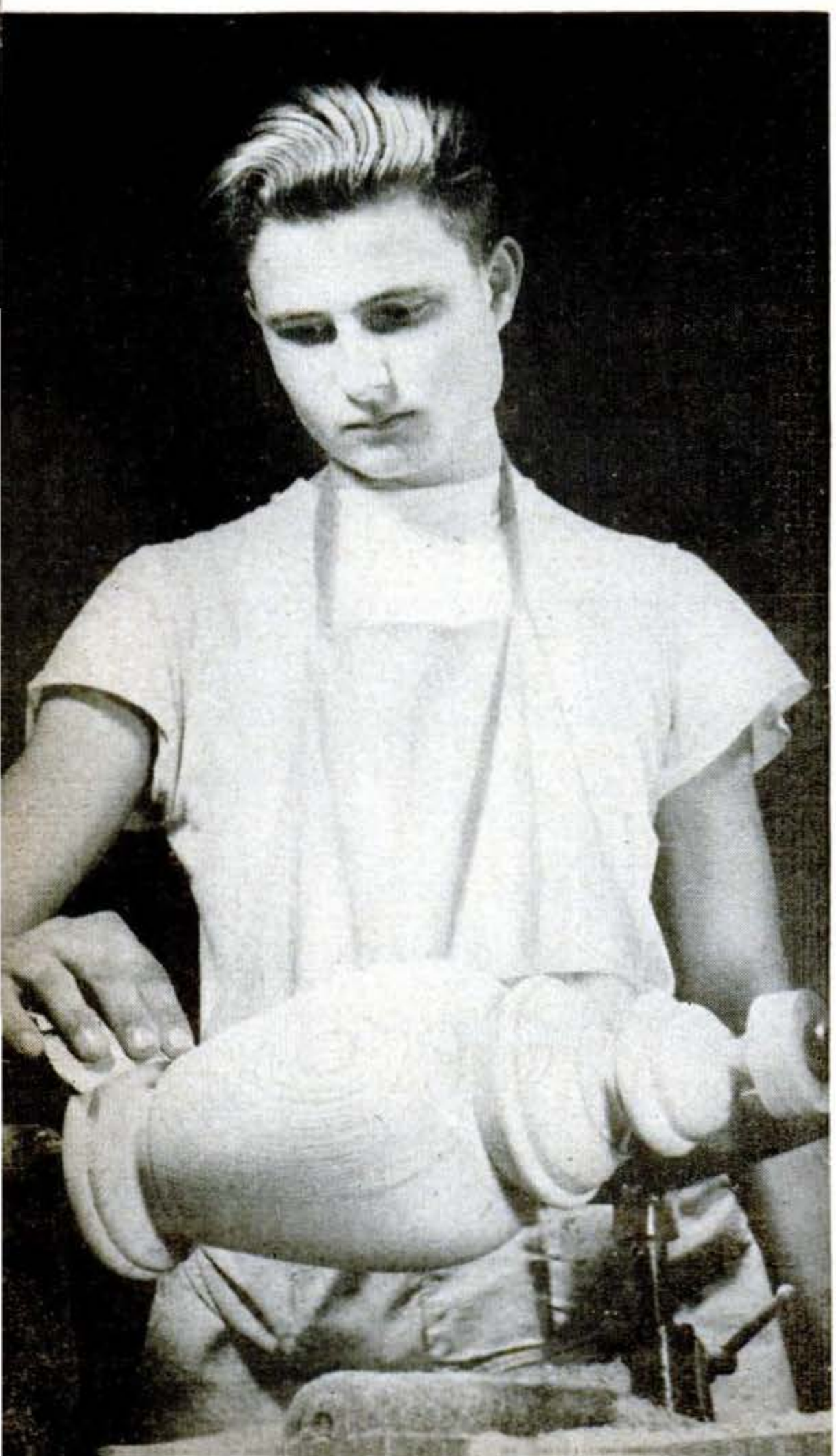


To turn a lamp base, reduce the piece to a cylinder and mark the length divisions. Then make sizing cuts at strategic points with a parting tool. Next, rough it to shape with shearing cuts made by a large gouge (as shown above at left). With practice, you can come pretty close to the final outline. To avoid frequent shifts of the tool rest, take finishing cuts on one section before rough-turning the next one. The center picture shows the long convex profile being planed with a skew. Shaping of the base cove is shown in the photo at right above. Note the position of the gouge handle as the tool is rolled on the rest.

Always remove the tool rest before sanding.

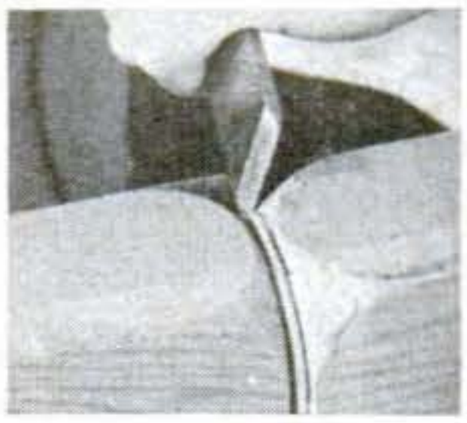
Cove: Scraping a cove is a cinch with a round-nosed chisel held flat on the tool rest. The minimum size is that of the tool, but a larger cove can be scooped out by swinging the chisel in an arc. Select a gouge no wider than the cove, placing it on the rest with the center line of the tool aimed at the center of the work. Push in near the side line with the bevel out, and turn the blade to a flat position. Repeat for the other side of the cove. The shearing cut leaves a glossy surface needing almost no sanding.





Reverse curves can be treated as combinations of beads and coves, the skew chisel, in turning the convex parts, being rolled on its edge and then rolled back to the flat position as the curve flows into the cove. Use the heel of the skew to clean angles against isolated beads and shoulders, and the point in narrow places. A parting tool is useful for dressing narrow fillets and small coves.

The square sections of table legs offer special problems. The stock must be accurately centered, the fingers must be kept out of the way of the flying corners, and the tool rest must clear them at all times. Square the ends with a narrow skew chisel, long point down, using light cuts to prevent splintering the faces of the square. Then cut the square beads, with the long skew point thrust in at a slight angle with the axis, and the handle swung gradually to right angles.



Sanding of turnings is simple, but be careful to avoid flattening projecting curves or making troughs in coves. Coarser sandpaper can be used than is customary for hand work. Keep it moving endwise of the spindle to prevent scoring, and as a final touch sand by hand lengthwise of the grain, with fine grit. Fine steel wool is useful for getting in small crannies. END

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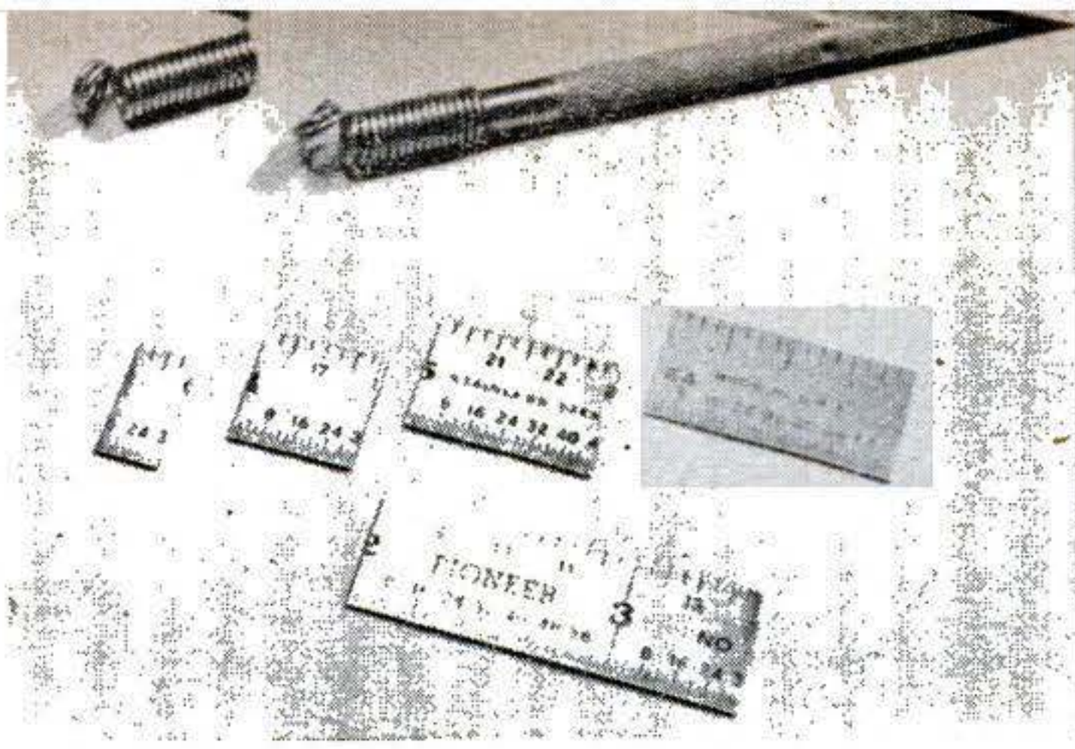
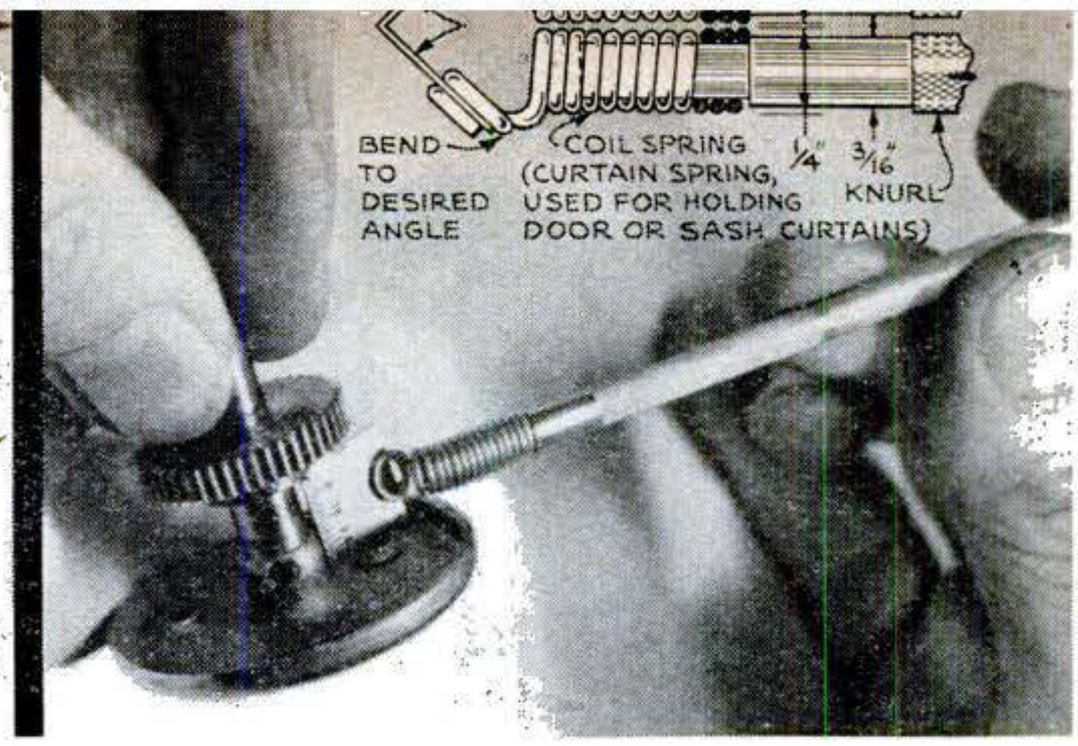
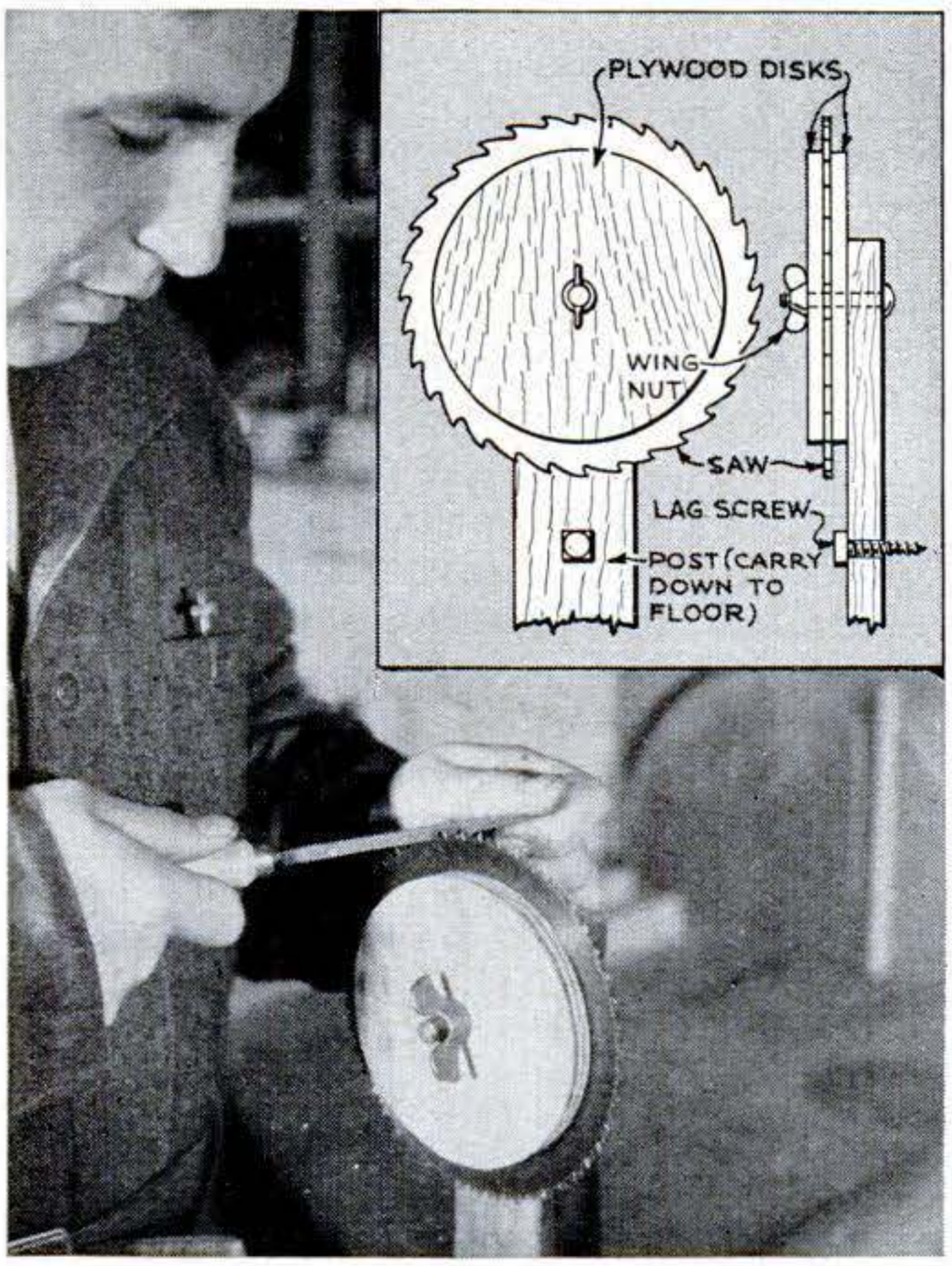




Measuring in Tight Spots

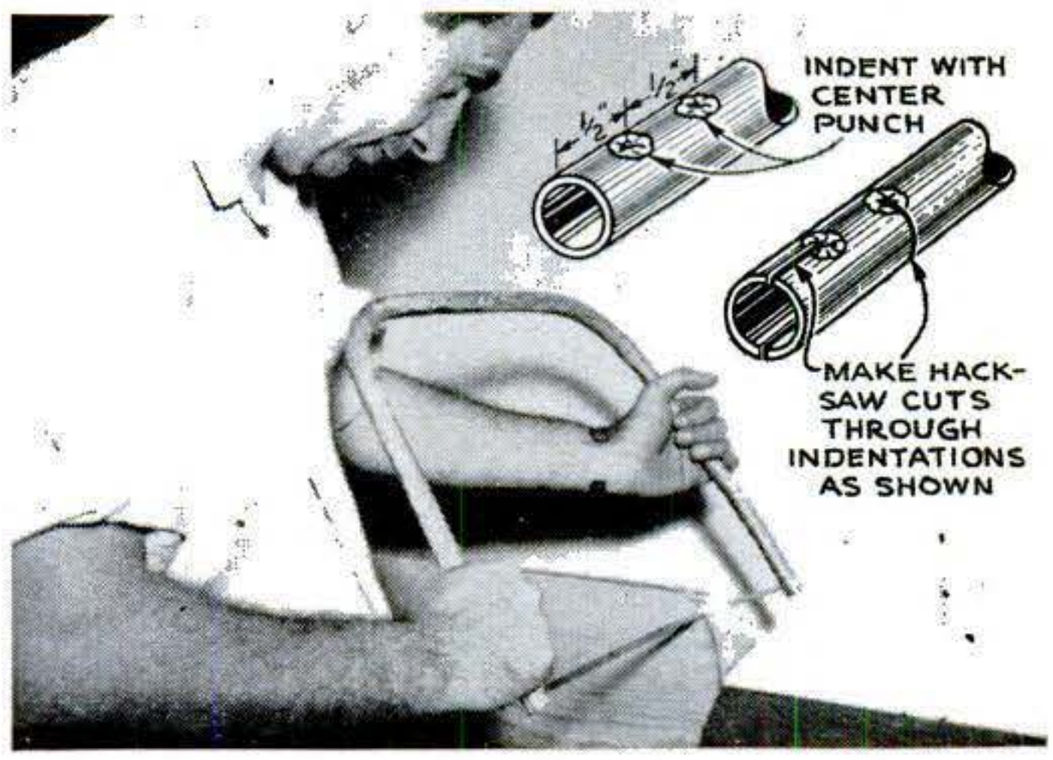
SHORT sections clipped from a flexible steel rule are timesavers when measuring in hard-to-reach places. The interior of instrument cases, gear boxes, and milled cavities usually are tough spots for measuring.

Tin snips will cut the rule. Leave enough extra metal so you can grind the ends to exact dimensions. Suitable lengths for segments include ¼", ⅜", ½", ¾", 1", and 1½". A handle for the segments can be made by slipping ¾" lengths of coil spring over the ends of a short rod. Bend up two loops at the end of each spring, as shown, to hold the rules.—*Walter E. Burton, Akron, Ohio.*



Jig for Filing Saw Blades

Two disks, cut from ½" plywood, will clamp a circular saw blade for filing. Saw the disks so about ¾" of the blade will show all around. Cut a two-by-two or two-by-four to reach from the floor to a convenient height. Then drill holes through the center of the disks and the post near the top. A stove bolt serves as an axle for disks and blade. A wing nut on the bolt will draw the assembly tight. Lag screws through the post will hold it to the front of a bench.—*Dick Hutchinson, El Monte, Calif.*



Bow Saw Made from Conduit

IF YOU don't have a bandsaw, here's a homemade bow saw that'll do the same job in some cases. It's bent from a 42" section of ½" conduit. The blades, standard bandsaw stock, can be bought by the foot or salvaged from old, broken blades.

To keep the conduit from kinking, fill it with sand or salt. Jam wooden plugs tightly into both ends and bend it to shape. With the filler still in the conduit, use a blunt center punch to make two deep indentations ½" and 1" from each end of the conduit. Remove the filler and hacksaw through the indentations—one cut from the end of the conduit and one from the side.

Anneal about 1" of each end of the blade by heating it red and covering it with ashes until cool. Now form a loop around a nail in the annealed portion. Unless heavy tension is used, don't reharden the loops.

The blades are fitted by springing the bow and slipping the blade into the desired slot.—*Evan Wright, Topeka, Kan.*

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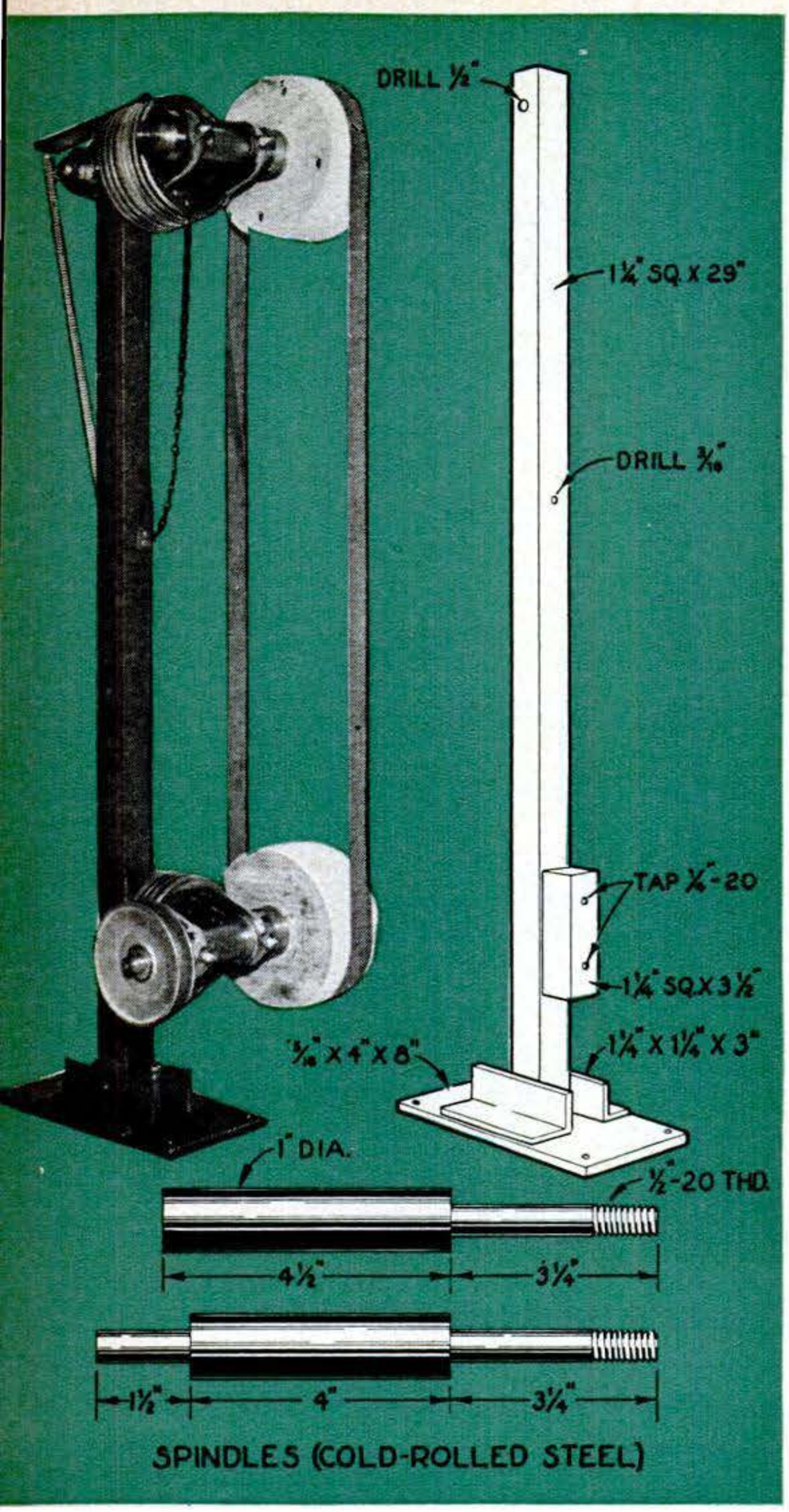


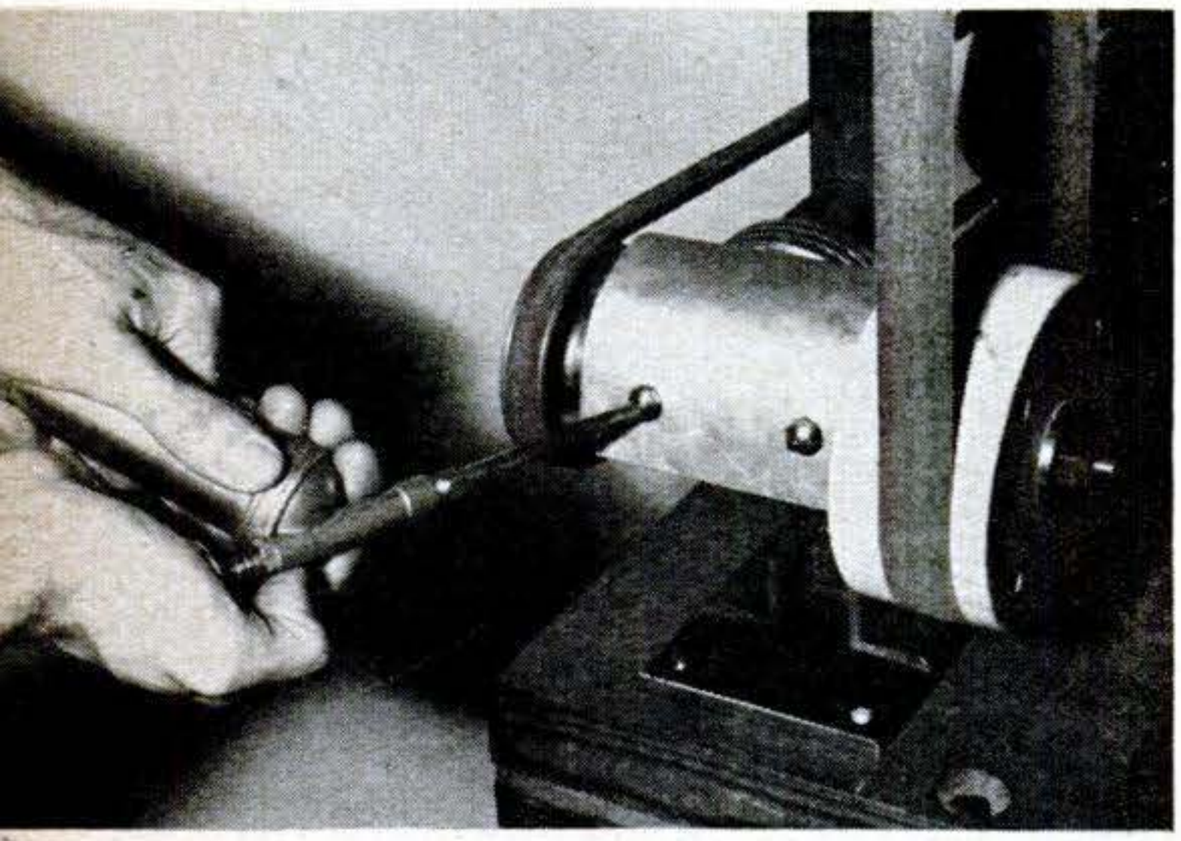
Make Your Own Belt Sander

A BELT SANDER like this will earn its keep many times over. It's especially useful for finicky filing, cutting, and shaping jobs on small metal parts. I don't use a table because I like flexibility for freehand work, but it wouldn't be hard to build one.

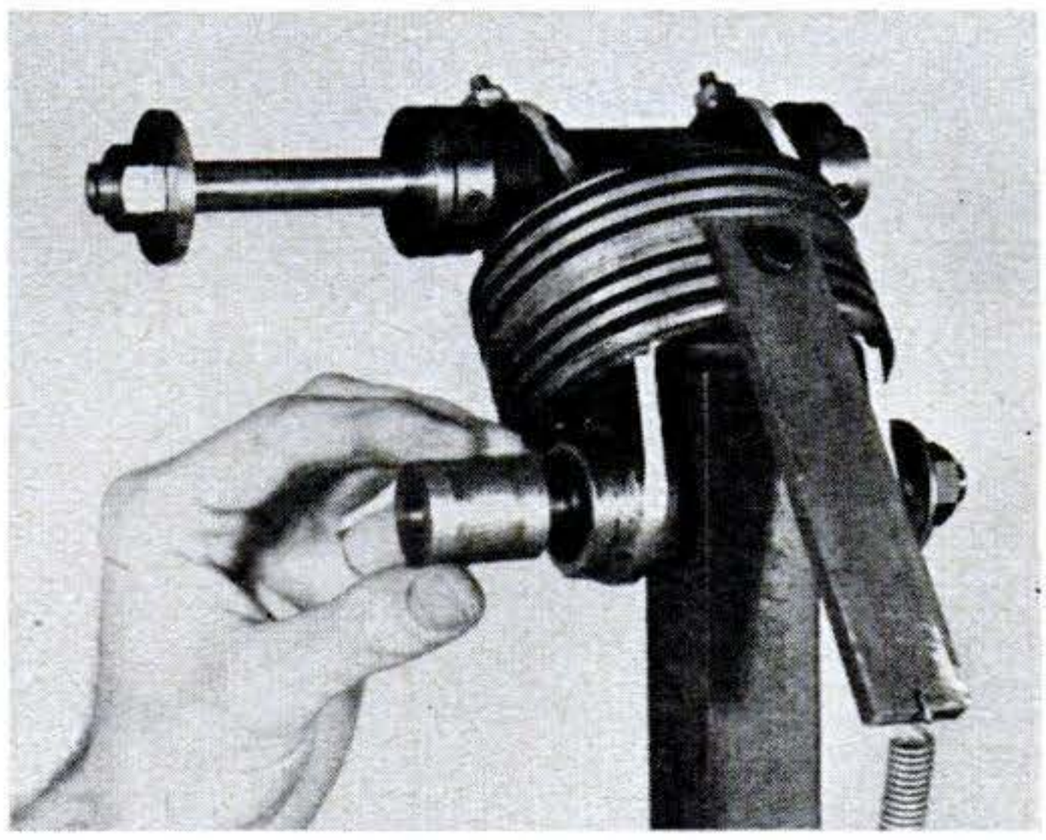
Dimensions can be altered to suit the material on hand, particularly the pistons used for bearings. The ones I used are from a Model-A Ford. The skirts were cut away and grease fittings tapped into the wrist-pin bosses. The belt-tensioning assembly, at the top, consists of two pistons bolted together, face to face, with ¼" cap screws. The bolt holes in the front piston are drilled oversize so it can be rotated slightly for belt-tracking adjustment.

The 2¼" by 5" pulleys were glued up and turned on a lathe. They have a 2° crown. Three 1" setscrew collars and the V-belt pulley and washer keep the shafts in place.

Abrasive strips of various widths may be used. Cut the ends in a long diagonal and cement with phenolic-resin glue. Spindle speed should not be over 1,750 r.p.m. Keep the bearings well lubricated. Check for adequate spindle end play when the bearings are warm.—*H. Smiley, Jr., Henniker, N. H.*



After skirts of pistons were cut away, grease fittings were tapped into wrist-pin bosses. It's important that the bearings be well lubricated with a light grease at all times.



The rear piston rod of the top assembly is mounted so it will pivot for belt tension. A collar that just fits in the wrist-pin bosses was used. Iron strap gives leverage for the spring.

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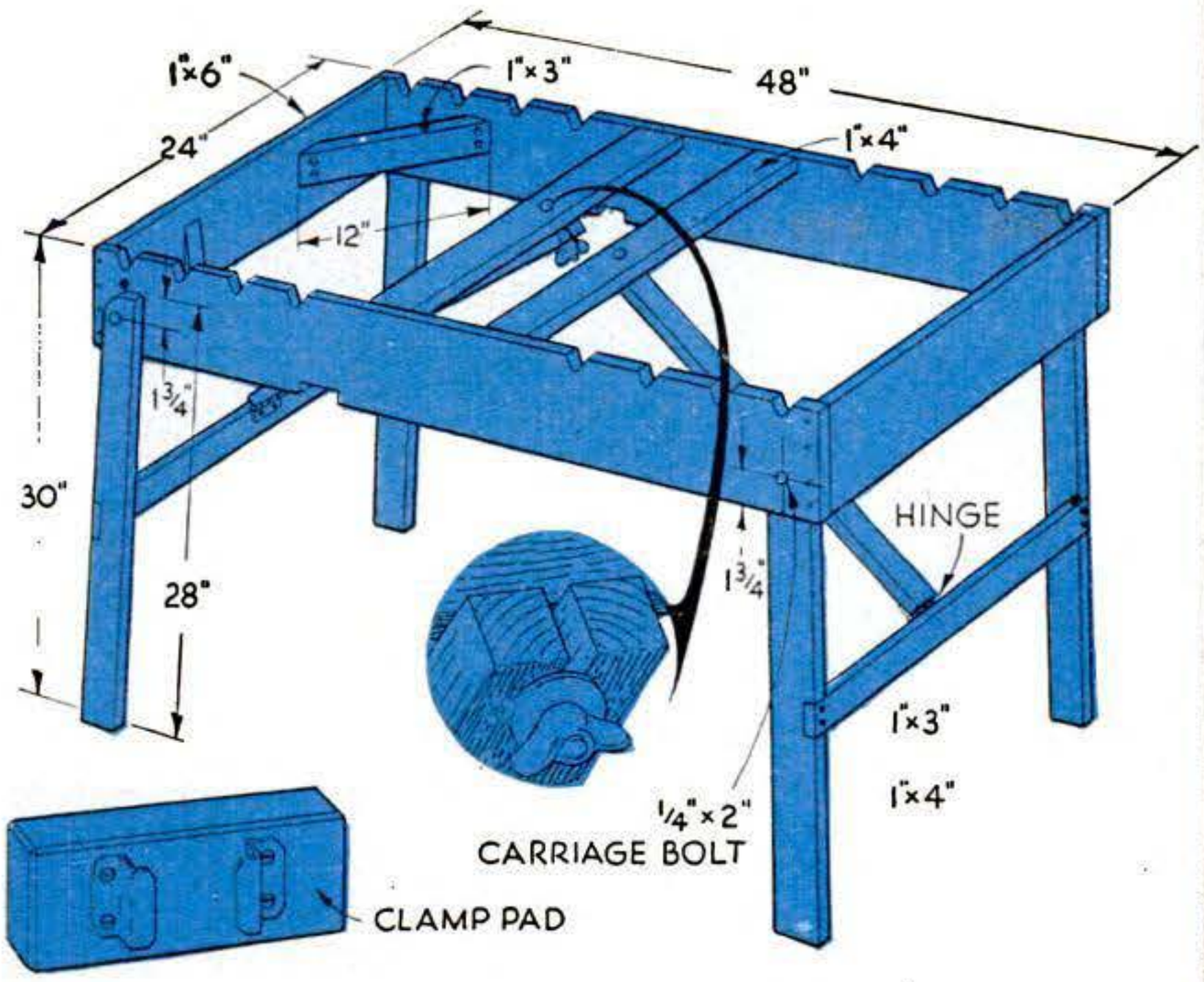


Notches in upper edge of frame align and retain clamps for a gluing job.

Open-Top Workbench Makes Gluing Easier

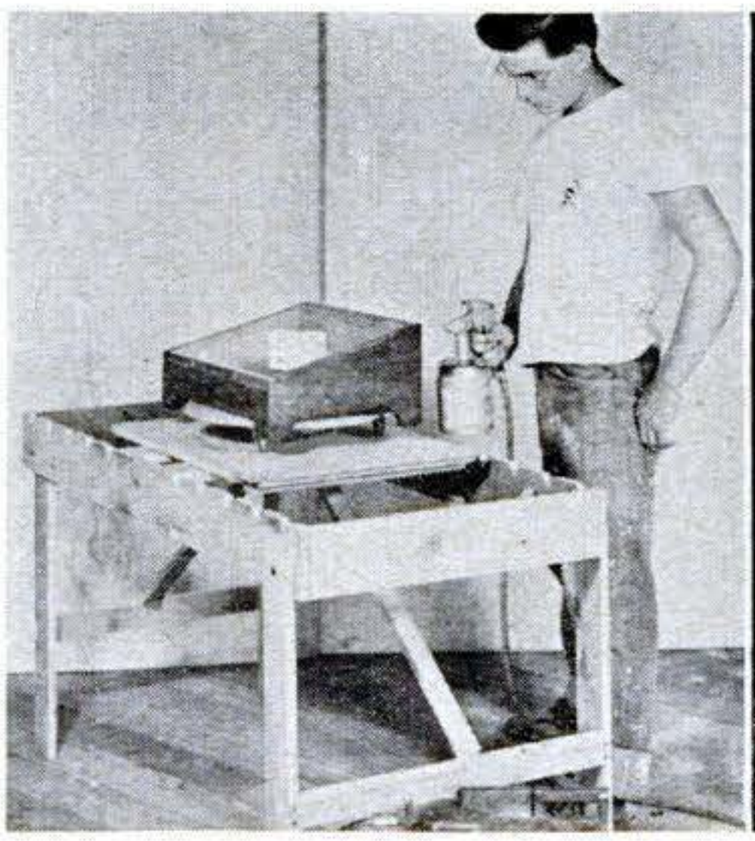
DO YOU need a gluing and assembling bench? A support for spraying small pieces of furniture? A place to do upholstering or other handyman jobs? This open-top table will serve all these purposes—and can be hung on the wall when not needed.

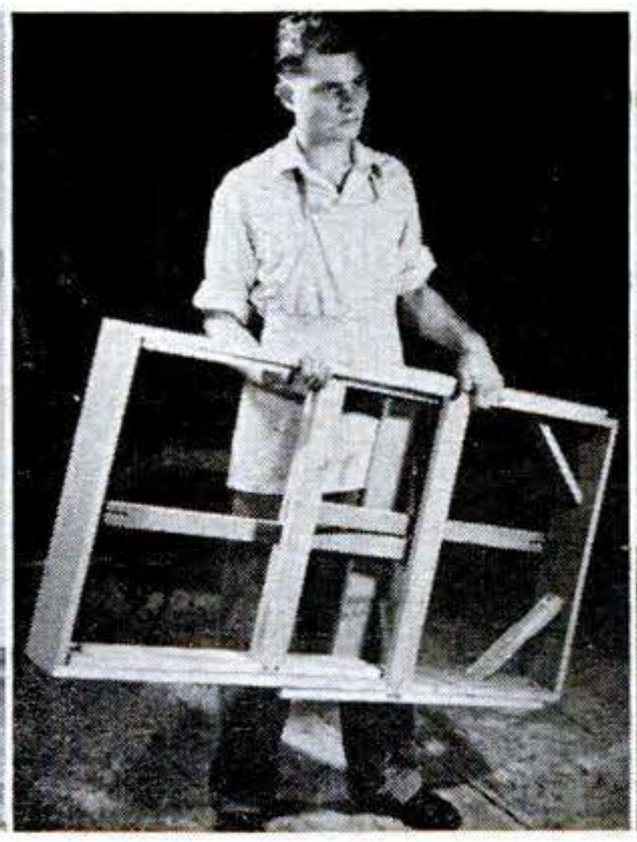
Simply nail the top frame together, holding it square with a diagonal strip temporarily tacked to the edges while you nail in the center stretchers and screw the corner braces in place. The stretchers butt between the frame's sidepieces.

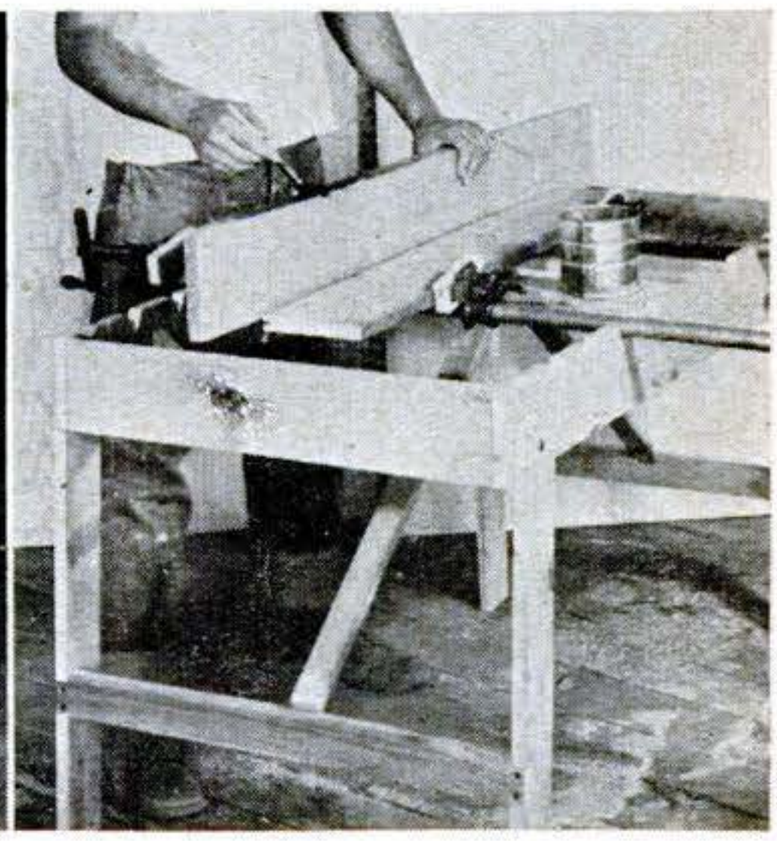
Note that one pair of legs pivots outside the frame and one inside to prevent interference when folded. Notch the stretchers into the legs and cut notches in the bottom edge of the top frame to clear the stretcher for the outside legs.

The two diagonal braces, hinged to the leg stretchers, should be located so they'll clear each other when the table is folded. A wing nut and washer on a carriage bolt locks each brace.

For a gluing job, you won't be bothered with clamp-jaw pads falling out if you bend Z clips from sheet metal as shown in the drawing and screw them to the blocks so they can clasp the clamp jaws. END







Sheet of plywood can be laid across the frame as a temporary work surface for such jobs as spraying paint on small objects. Folded, as shown in center photo, table is ready for hanging out of the way. At the right, note that the table supports the work at a convenient height.

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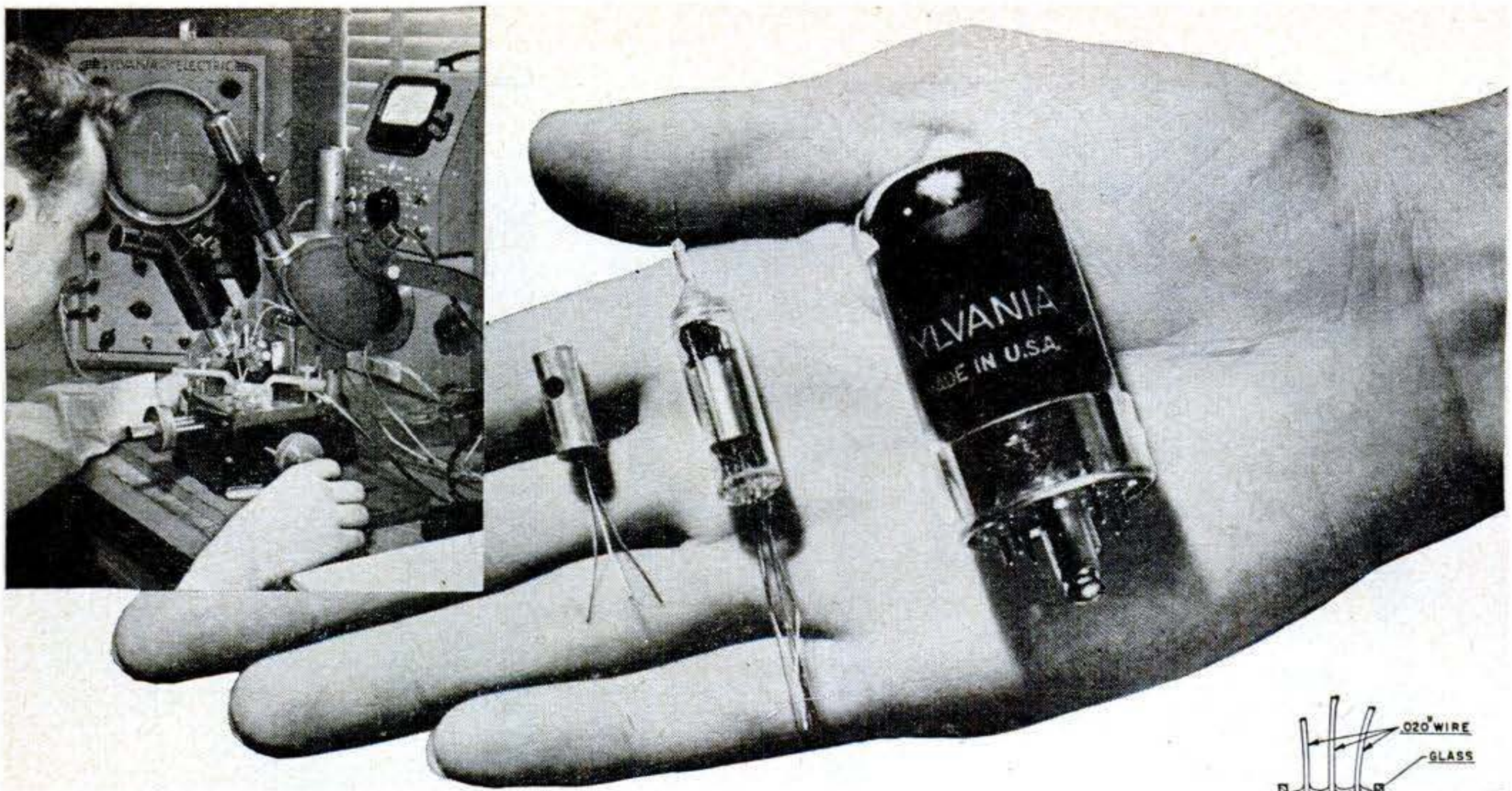
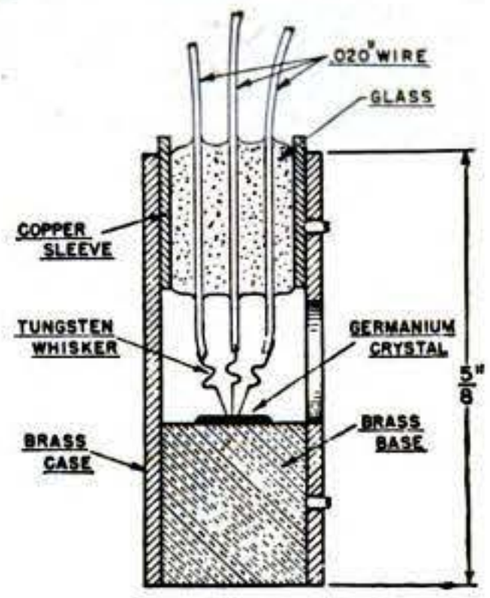


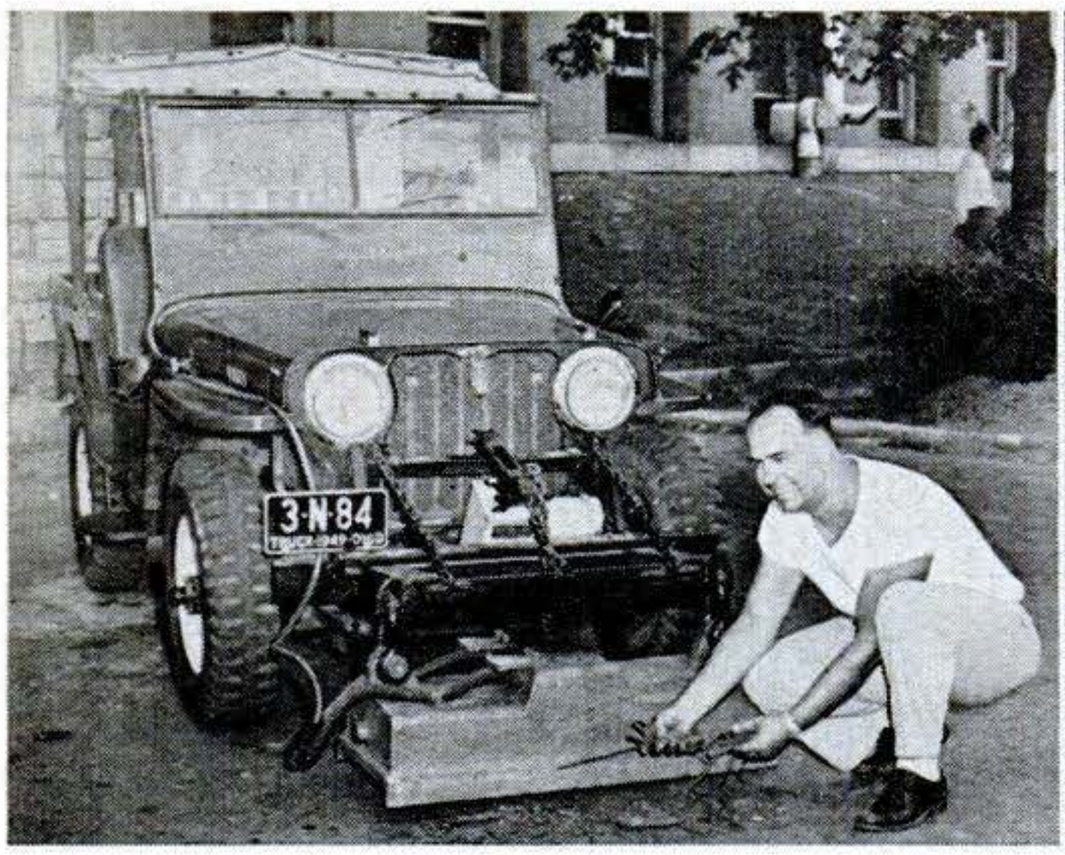
Crystal Tetrode May Replace Tubes

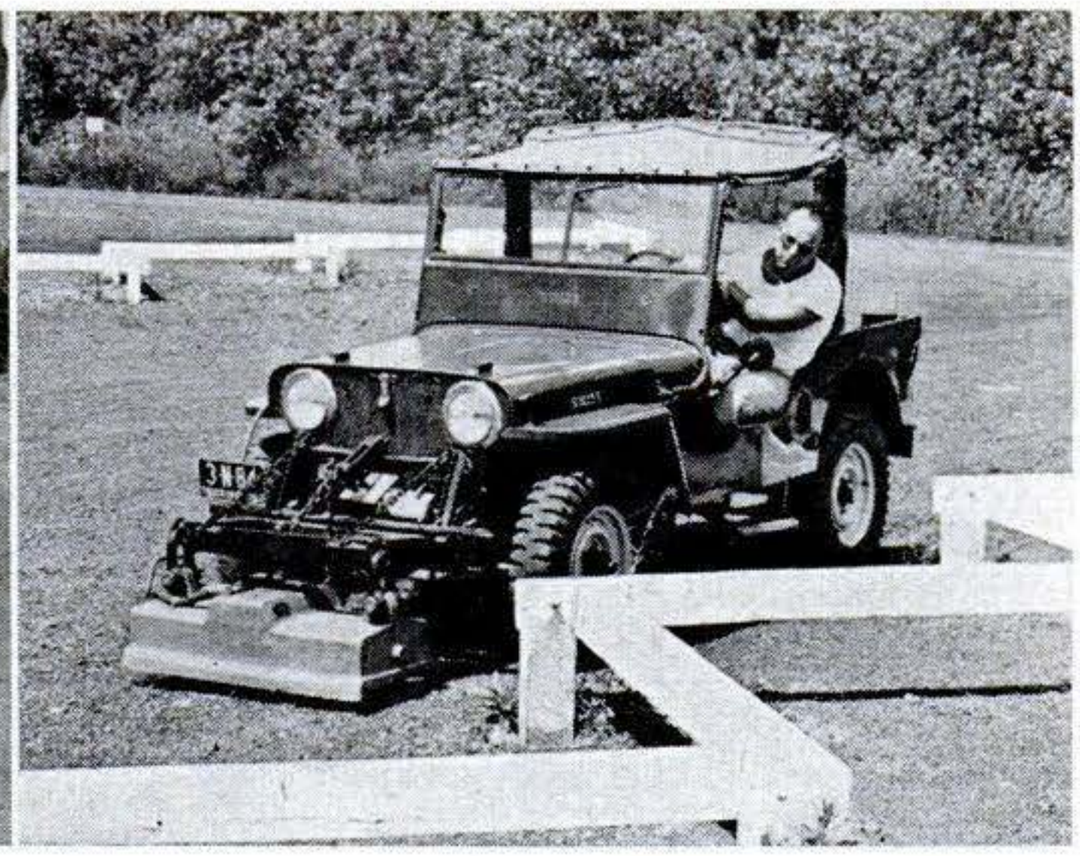


CRYSTAL TETRODE

NEWEST addition to the experimental use of crystals in the place of tubes in radio receivers is the crystal tetrode developed by Sylvania Electric. The hand above holds, from left to right, the tiny tetrode, a subminiature tube, and a standard-sized tube.

The crystal tetrode will operate at higher frequencies than the amplifying crystal triode or "transitor" (PS, Sept. '48, p. 117), a recent development that has made possible the construction of tubeless receivers. Tetrodes have been used successfully in mixer circuits like those in superheterodyne receivers. The three whiskers used in the tetrode, at right, are arranged triangularly with about .002 in. spacing between the points. At upper left, the wires are being set with a micromanipulator.





Jeep Sweep Prevents Flats

THE gimmick on the jeep pictured above is a 1,000-pound magnet, and the man exhibiting the metal debris the magnet collected is Stanley W. Smale, of Toledo, Ohio. Smale makes it his business to sweep parking lots, truck terminals, and similar areas for nails, tacks, and jagged pieces of metal that puncture tires. What he calls the Jeep Sweep is shown in operation at right. The magnet, raised and lowered by hydraulic lift, hoists better than its own weight. Power is supplied by a 2-kilovolt generator in back. The dash controls include a switch that lets the operator de-energize the magnet.

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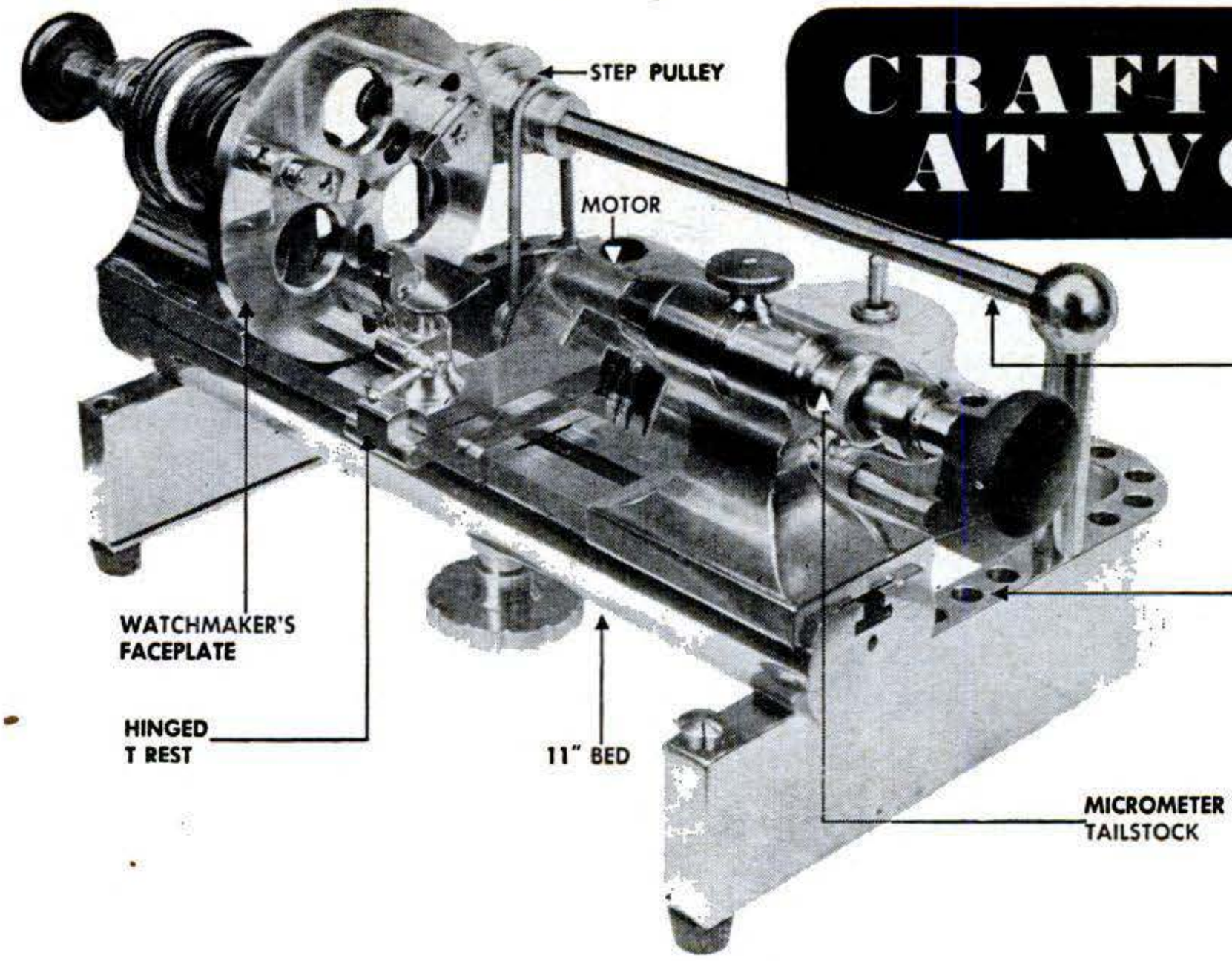
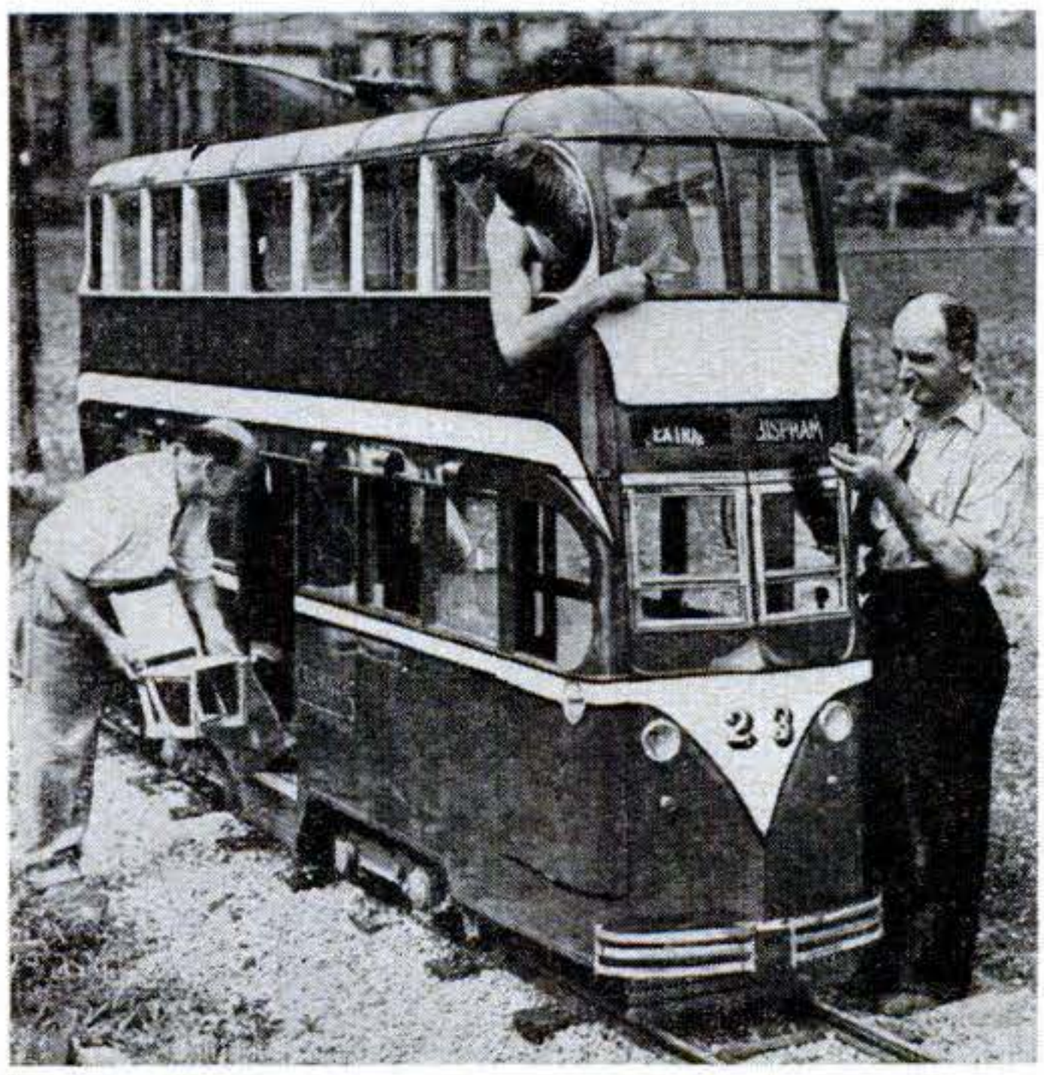
CRAFTSMEN AT WORK

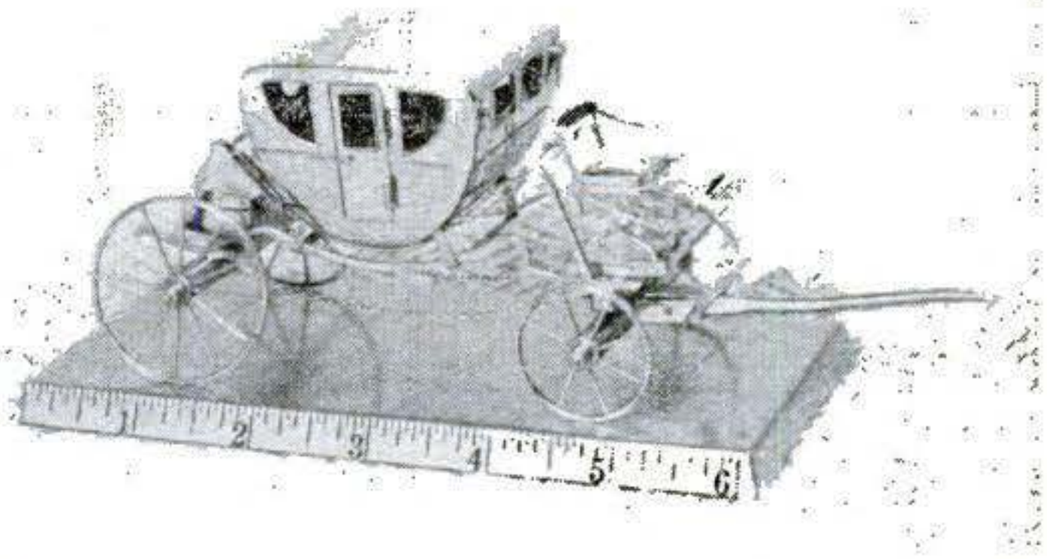


This dream lathe, which took four years to design and build, was made for a friend by Ernest Millholland, president of an Indianapolis machine shop. It is a watchmaker's lathe that incorporates every feature that the watchmaker friend could specify. Parts that might be touched by the user's hands are polished stainless steel.



Trolley-enthusiast C. W. Lane, of New Barnet, England, likes "trams" so much he built one of his own. This green-and-cream double-decker seats 17 children—with apparently no room for straphangers. It has motors at either end, can be lighted at night, and draws power from an overhead wire, just like the Blackpool streamliners after which it was modeled. It doesn't go anywhere in particular, having only 110 yards of track.

Two PS articles were combined by D. W. McLimont, Fort Williams, Ont., to make this musical coffee table. It's a phonograph using a speaker-amplifier (PS, Jan. '49, p. 243) in a coffee-table cabinet (PS, May '41, p. 161).



Stainless steel wasn't invented in George Washington's day, but this model of the first president's coach is completely handmade of that tough, shiny metal. Emil Ziegler, of Philadelphia, fashioned the painstaking job from plans in the June '46 PS (p. 176).

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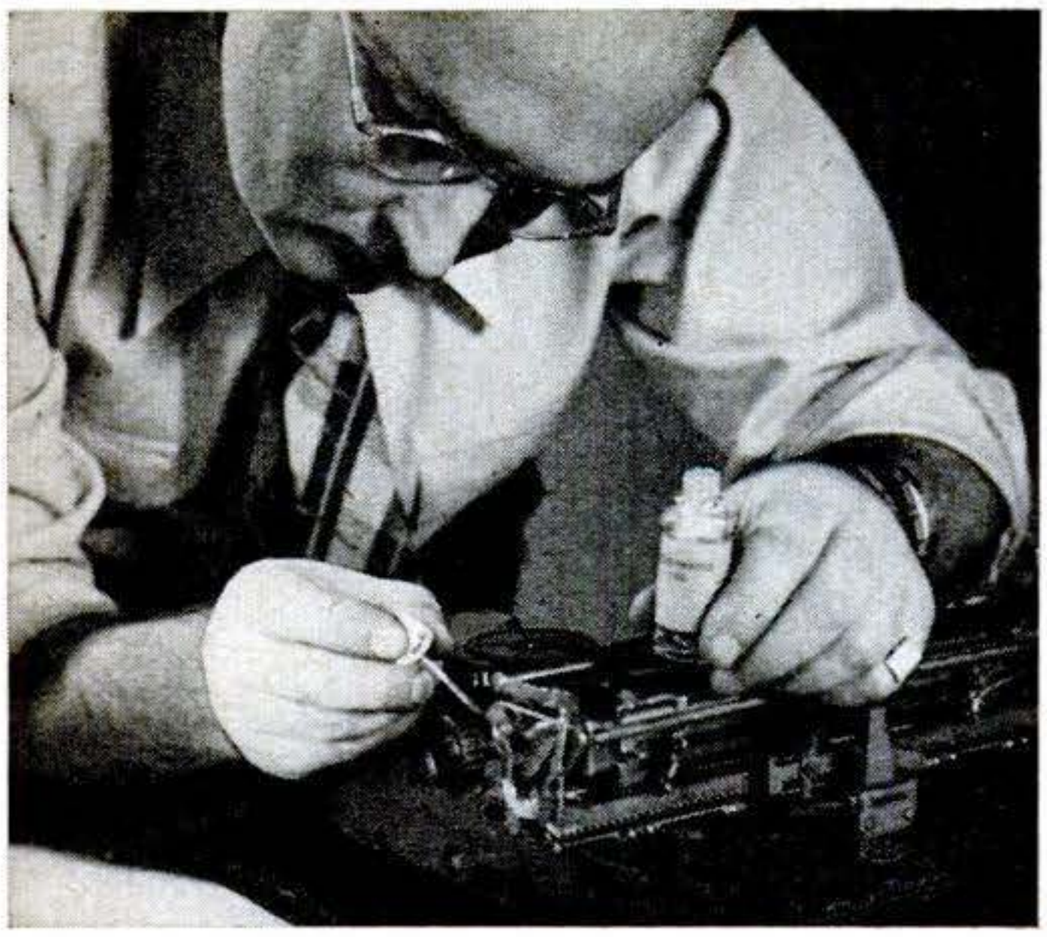
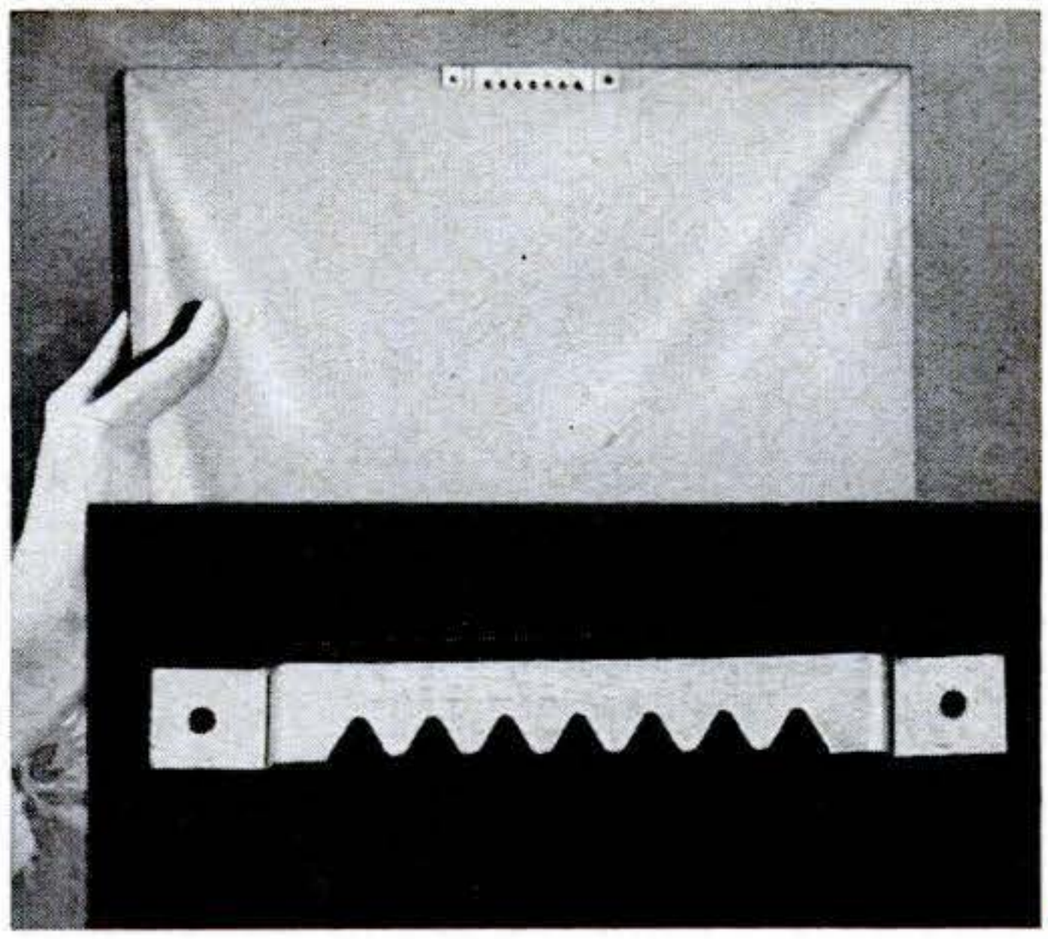


Bottle for Typewriter Oil

STORE typewriter oil in a fingernail-polish bottle. It's a small container, but you never use much of this oil at a time, and the brush makes a convenient applicator. Be sure to clean the brush and bottle with polish thinner before you pour in the oil.—*Ken Murray, Colon, Mich.*

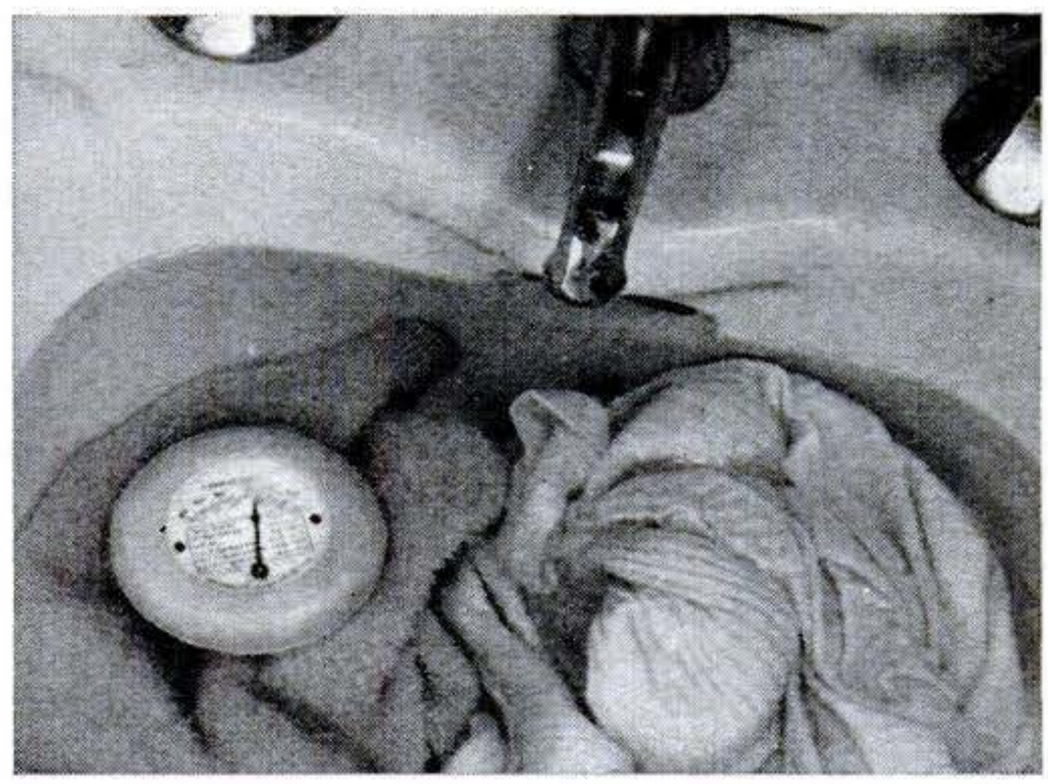


Picture Hanger Stays Level

CALLED the Pic-Hang®, this little toothed strip of metal helps you level a picture. The hanger is tacked to the upper edge of a picture frame. In use, the hanger is positioned on a nail in the wall in the notch that levels the picture. The Franklin Picture Frame Co., Chicago, is the maker.

House Number Lights Steps

MOUNTED over the steps, this lamp not only illuminates your house number but also throws light on the steps. The front and bottom of the lamp housing are glass. The numbers are decals that you put on yourself. Step-Lite Co., Kansas City, Mo., sells the unit for about $2.

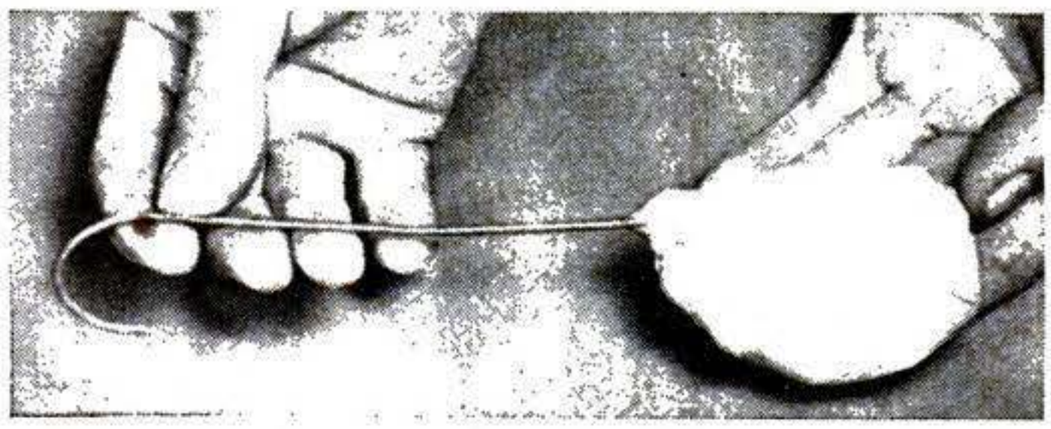


Thermometer Floats in Tub

THIS thermometer enables the housewife to launder various fabrics at their recommended temperatures. The thermometer, encased in a soft rubber doughnut, floats in the water with the wash. It sells for $1 from the Cooper Oven Thermometer Company, of Pequabuck, Conn.

Putty Hook Hooks on Ladder

HERE'S a handy gimmick when doing putty jobs. Shape a piece of heavy wire to a hook on one end and a loop on the other. Mold a wad of putty around the loop and hang the hook end on a ladder rung or on your belt.—*Benjamin Nielson, Aurora, Neb.*



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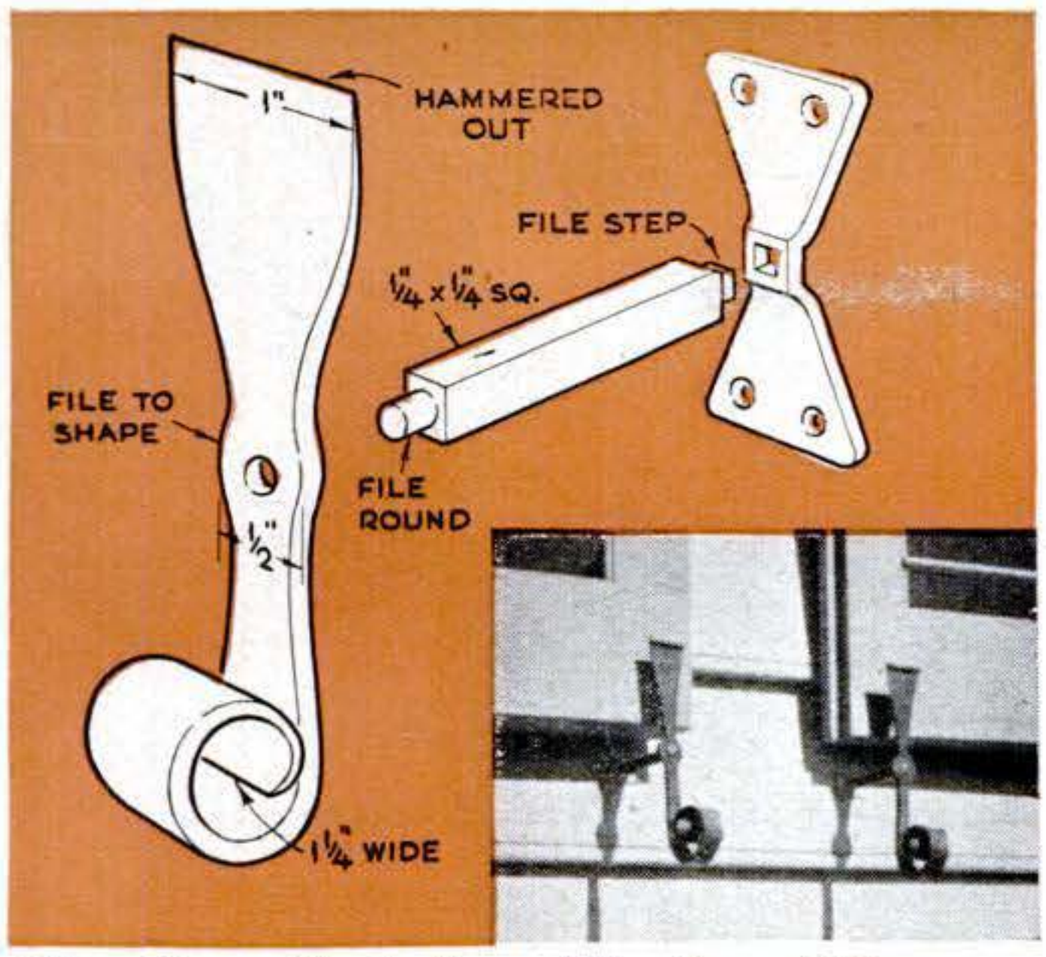
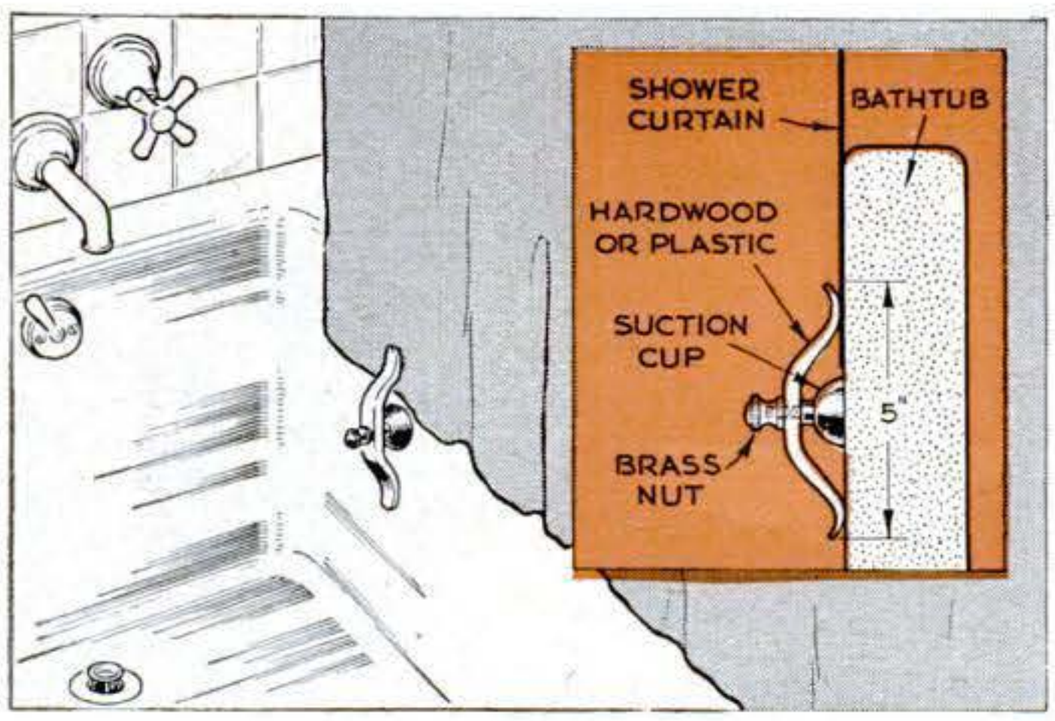


Shutter Catches Made of Iron

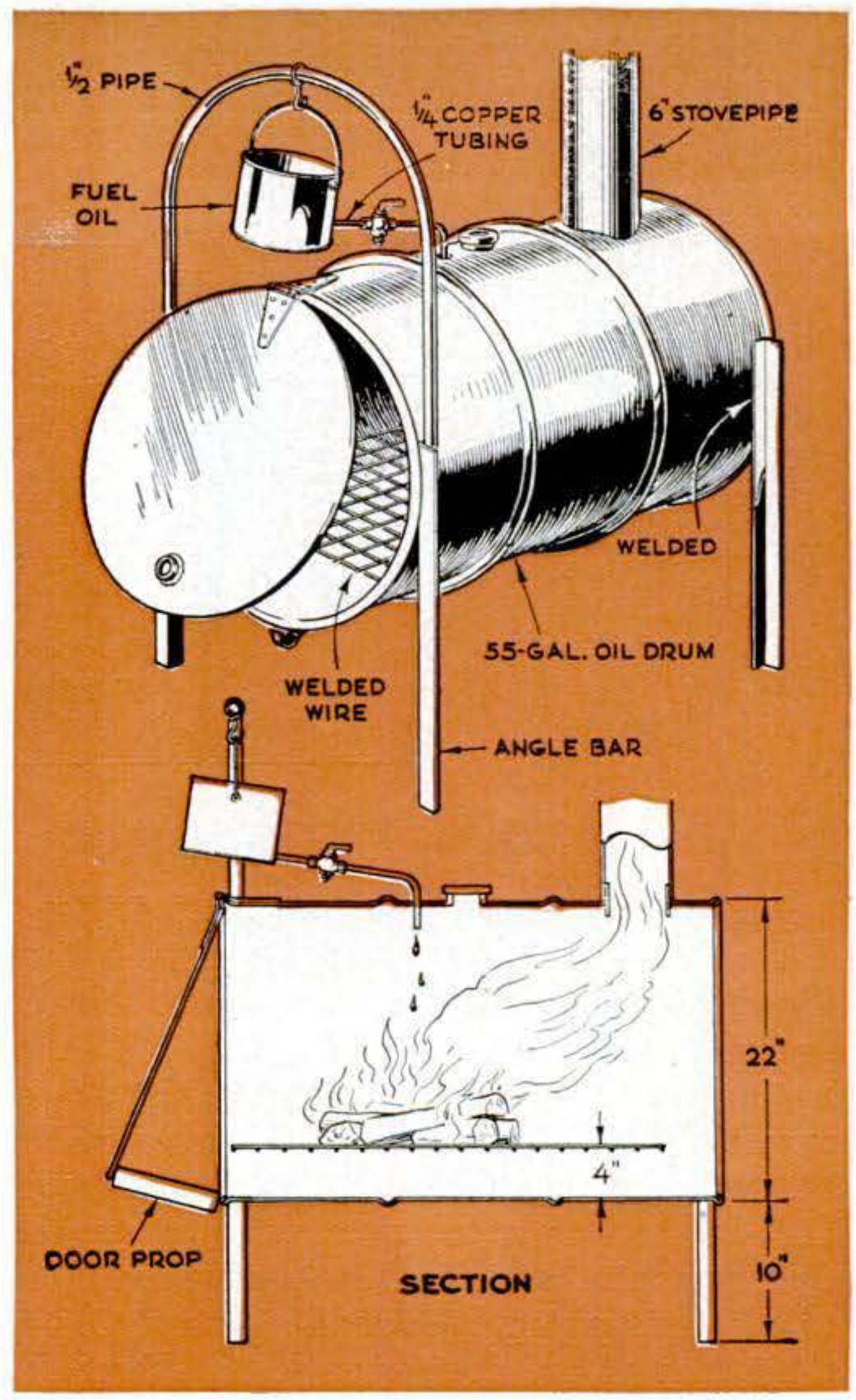
NEED some shutter catches? Perhaps these, photographed in historic Williamsburg, Va., will appeal to you. If you aren't experienced at simple blacksmithing, see the article in PS for Jan. '49, p. 206.

The catch bar pivots on a stem made of ¼" square stock that's riveted into a butterfly fixture fastened to the building. The square hole in the base fixture is best punched but can be drilled and filed. Flat stock, ⅛" by ½", is used for the catch. It is hammered out to 1" at one end and slightly more at the other.



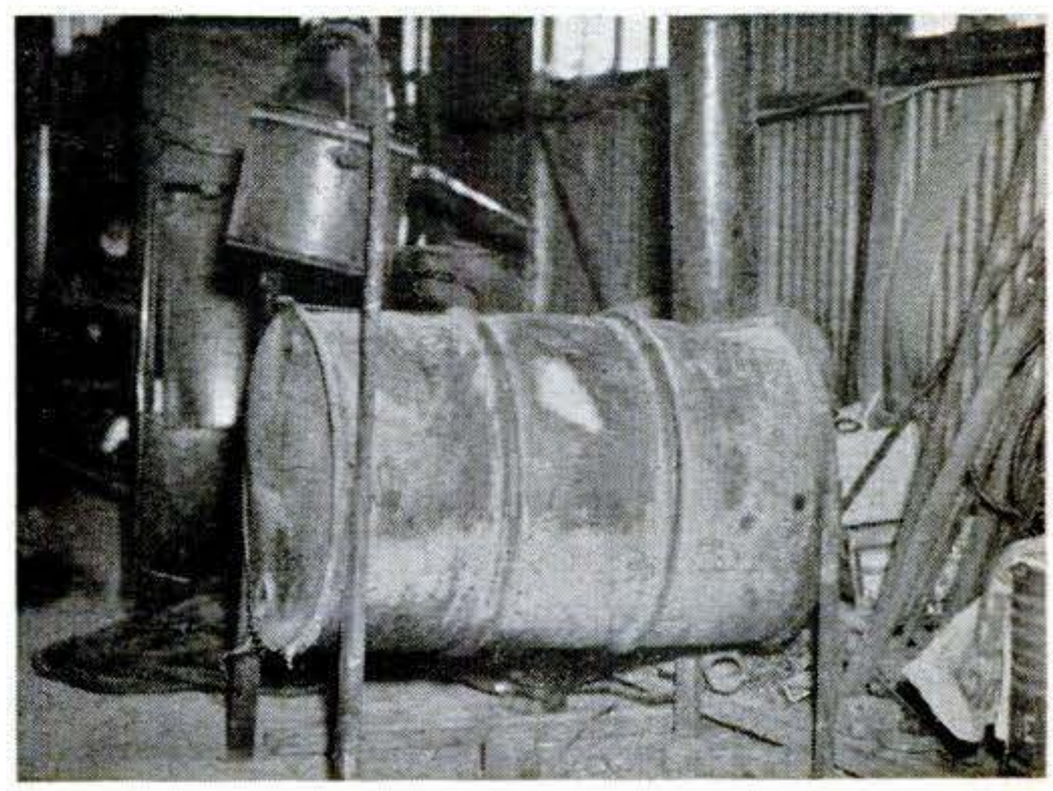
Shower Curtain Held in Place

EVERY time I took a shower the curtain would blow against me like a sticky plaster. I stopped that annoyance by making a pair of the gadgets shown above. The holders are made of hardwood, although plastic could be used. They were drilled ¼" and mounted on suction cups with nuts, as shown. When you mount the cups on the inside of the tub, wet them with a little soapy water. They'll stick better.—*B. Cohen, Toronto, Ont., Canada.*



Shop Heater Made from Drum

BURNING wood or trash, this heater was built by George Hammerschmidt, of Lakeview, Calif., for the workshop on his ranch. It's a standard 55-gal. oil drum with one end cut out and legs welded on. A strap hinge, welded to the cut-out end and to the drum, makes a door. A grate of heavy mesh is welded inside the drum. A brisk fire is kept burning by the drip of light fuel oil or old crankcase drainings. The valve regulates the drip. Practically anything that will burn can be used as fuel, thanks to the oil.



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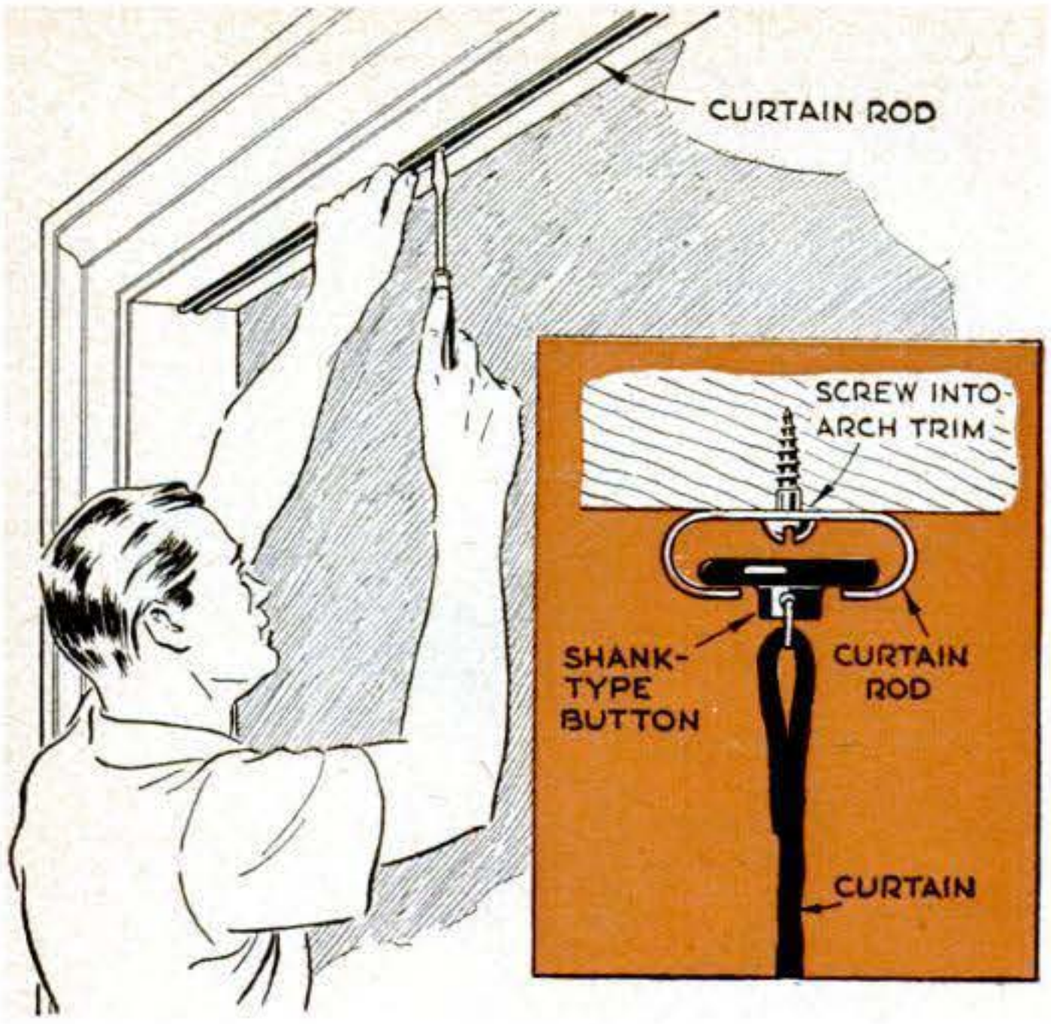
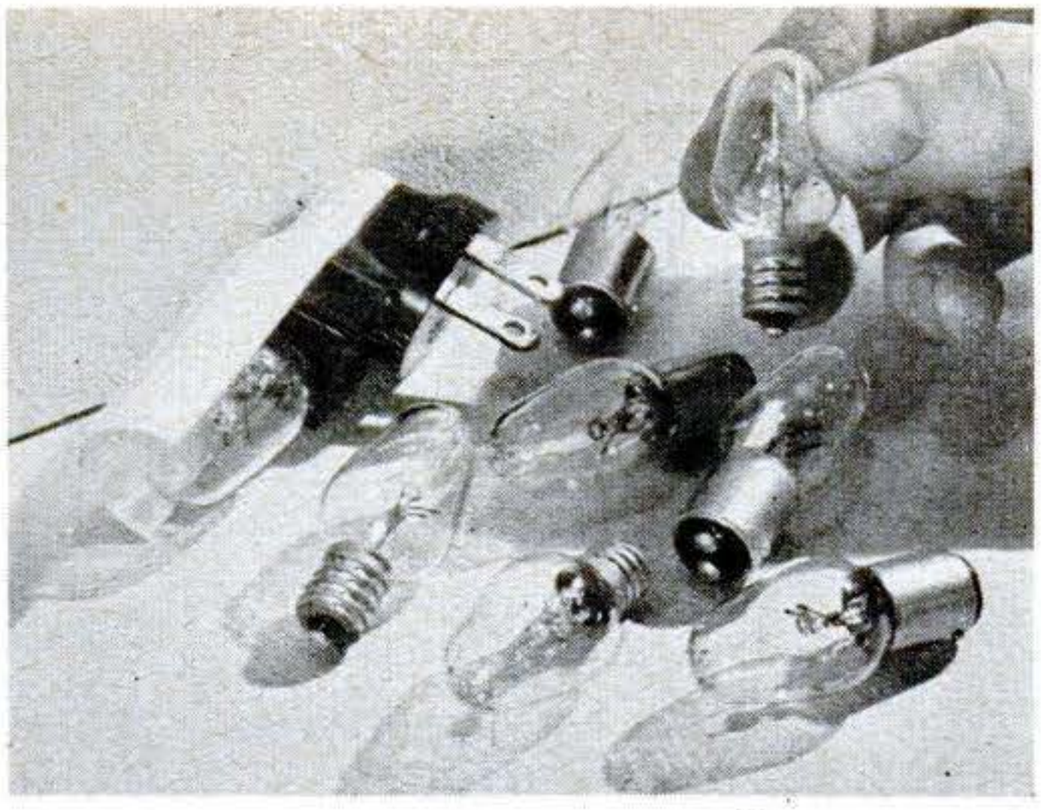


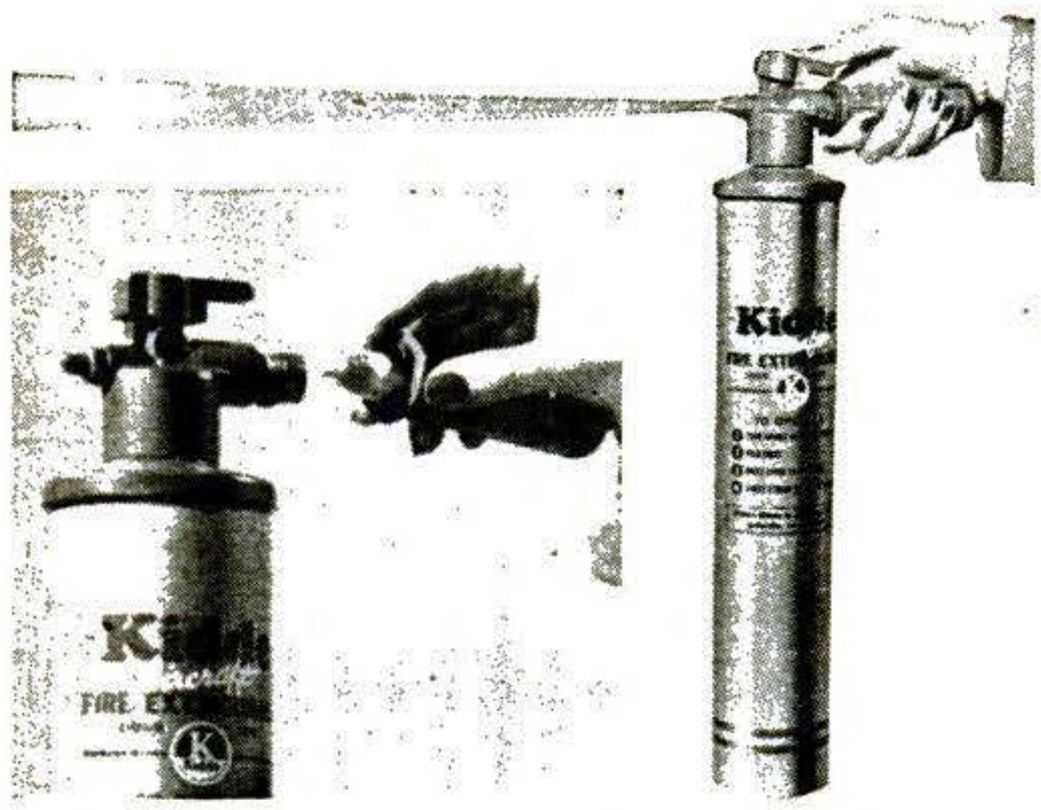
Drapes Slide in Curtain Rod

My wife wanted to hang drapes across a doorway 8′ wide but thought a pole that long would look cumbersome. Since regular curtain tracks are costly, I came up with this substitute. The top hem of the drapes was sewn to shank-type buttons. These were inserted in the track of flat, telescoping curtain rods. The rods were screwed to the doorway trim, as shown in the sketch. Use of the telescoping rods made it easy to suit the width of the doorway.—*H. J. Campbell, Brockville, Ont., Canada.*



Little Lamp Has Long Life

This 10-watt lamp has an estimated life almost as long as Rip Van Winkle's nap. Designed primarily for pilot-light service, it's estimated that the lamp will burn continuously for a dozen years if not disturbed by severe shock or overvoltage. One use for the lamp is as a pilot light on deep-freeze units. (Such a light burns as long as low temperatures are maintained in the unit.) It can be used as a night light or as a lamp for constant illumination at hazard points, such as stairways. Made by the General Electric Co., the 10C7 bulb is available with either a candelabra screw base or a double-contact bayonet base. It operates at a lower temperature than other 10-watt lamps.



Gas Powers Extinguisher

A small cartridge of carbon dioxide supplies pressure to shoot a stream of water 20′ from this extinguisher. Walter Kidde & Company, Inc., of New York City, makes it for use in aircraft interiors. A light supporting bracket simplifies installation. Full, it holds 1⅜ qt. of water, weighs less than 7 lb. It can be refilled by unscrewing the top.

Fast Cutter for Sheet Metal

Save your tin snips for fussy work and thin stock; this cutting tool will make fast work of steel up to 10 gauge. Heat and upset one end of a length of bar steel, preferably high-carbon stock. Flatten one side of the end into a sharp blade 1″ to 2″ long. Pound the other side into a knob, and harden the blade. To use it, guide the blade along the layout lines and pound the knob with a heavy hammer. I've found this method very speedy.—*William M. McKeever, Darwin, Calif.*

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Secure in their icy berths, small craft sleep through the winter in Eel Pond, Cape Cod, Mass.

Putting Your Boat on Ice for the Winter

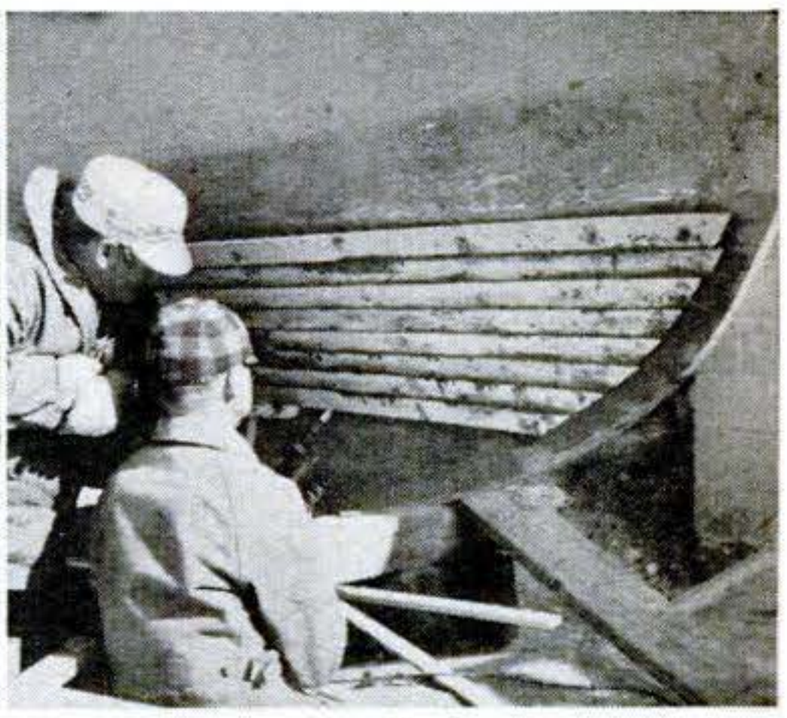
By Elon Jessup

LEAVING a boat in the water through a New England winter looks like rank carelessness. But the salt-water folk Down East know what they're doing. Wet storage, as they call it, is safe enough in salt water. The ice formed is relatively soft and flexible. Fresh-water ice is heavy and compact and likely to damage a hull. But winter storage even in salt water calls for some precautions.

Here are a few of the advantages of wet storage: It's obviously economical; the fire hazard, often present ashore, is practically nonexistent; and the boat is where it belongs —in the water. Hauling a boat ashore usually puts some strain on the timbers.

With ice thick enough to walk on, craft is visited periodically to pump out bilge water. Bilge must not be allowed to freeze, but weather must be very cold before it will freeze.

The man who decides on wet storage usually picks a small, sheltered cove. In contrast to open waters outside, the cove probably will freeze tight. But while still ice can be harmless, the open water eventually will fill with moving floes. And moving ice, in contact with a hull, can do serious damage. Even in the cove, if the ice is thick enough to walk on, it can hurt a boat unless you take the precautions shown here.



Ice saw is used to cut narrow waterway around hull in photo at left. Some boatmen prefer to leave ice at bow and stern to prevent hull from swinging against edges of ice. Ice that forms during later freezes can be broken up with a boat hook, center. Hulls of small boats that operate during winter are sheathed with oak strips, right, to protect planking from ice.

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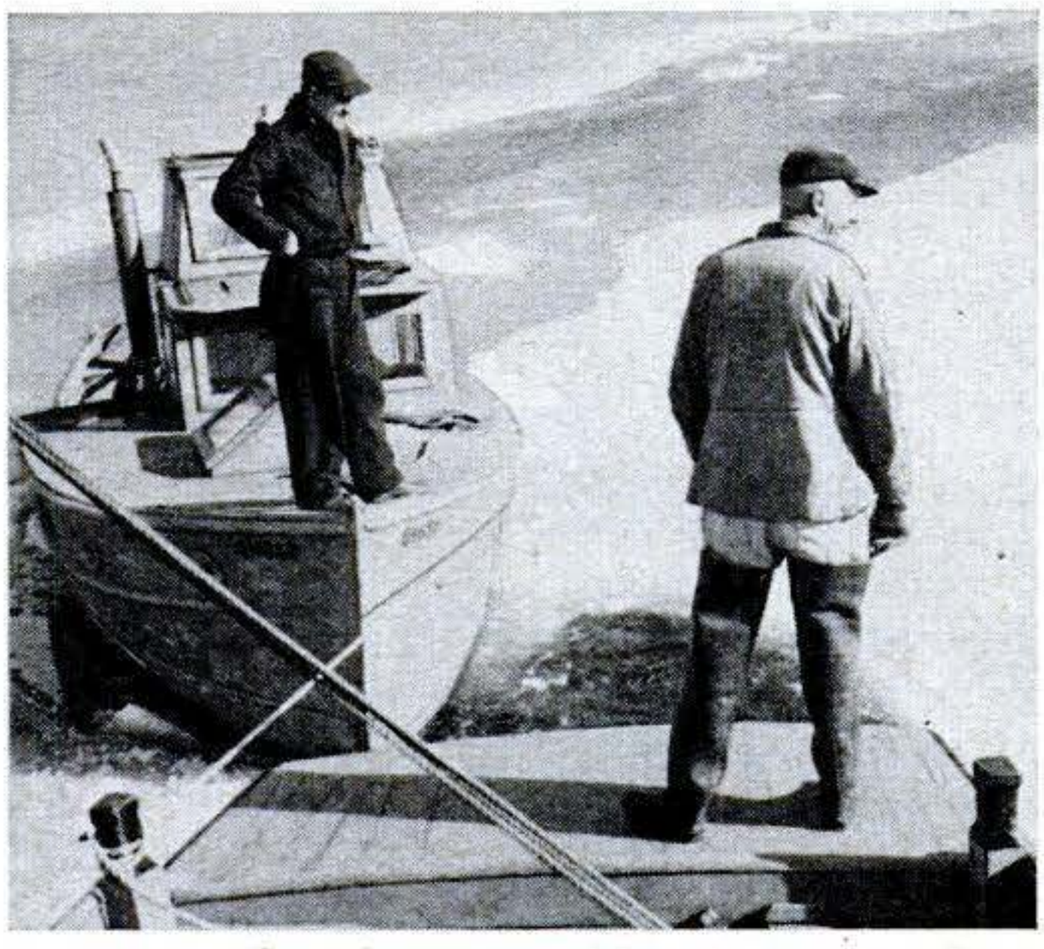
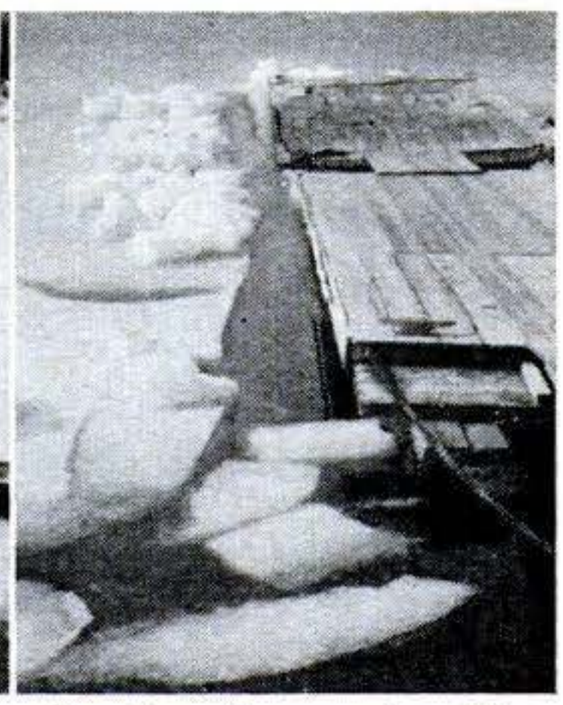
Sometimes a channel has to be opened. Turbulence created by propeller is effective icebreaker. Engine is run at full speed, but boat is made fast to a dock. Jabs with a boat hook help break ice. When boat is not near a dock (right) anchor is hooked in hole in ice.



Two boats often team up to open channel. While one is tied to dock breaking ice at stern, the other smashes ahead. After slipping bow up on ice to take advantage of boat's weight, skipper rocks craft to break through the ice. This is repeated until free boat reaches other one.



Piers and floats need winter attention, too. At left, above, is example of wrecked pier. Clinging ice and rising tide combined to unanchor some of the pilings. To prevent this, water lanes are chopped out around piles (center). New ice is broken up with boat hook. Floats can be completely wrecked by thick ice. Float at right was saved by sawing away ice all around it.

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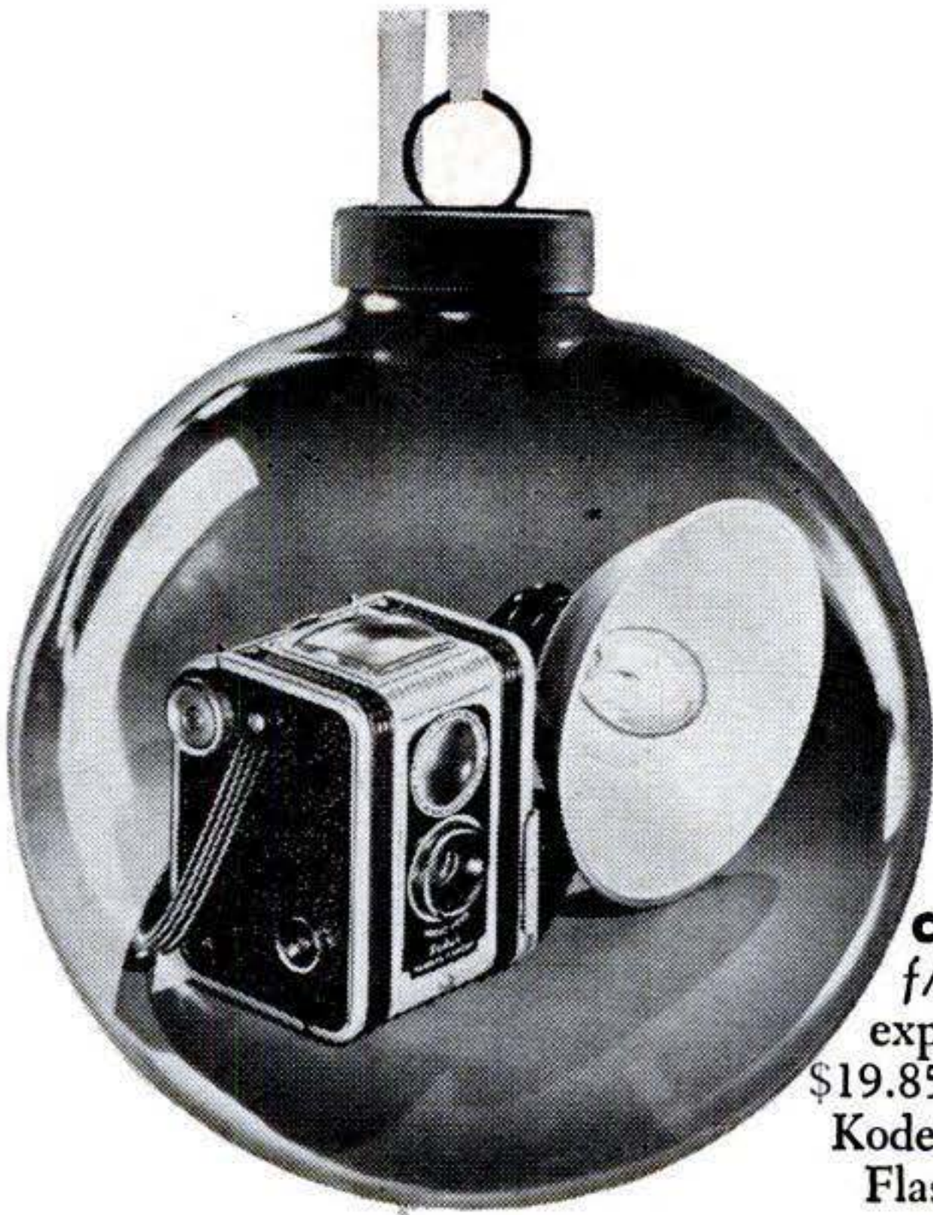

Kodak Flash Bantam f/4.5 Camera—Fast *f*/4.5 Lumenized lens. 1/200 shutter synchronized for "flash." Automatic film stop. $49.50. Flasholder, $11.08.

Kodak Duaflex Camera—Three stops: *f*/8, *f*/11, *f*/16. Double-exposure prevention. $19.85. With fixed-focus Kodet Lens, $12.75. Flasholder, $3.33.

Kodak Tourist f/4.5 Camera New 1/800 shutter, $95. With *f*/4.5 lens, 1/200 shutter, $71. With *f*/6.3 lens, $47.50; *f*/8.8 lens, $38.50; Kodet Lens, $24.50. Flasholder, $11.08.

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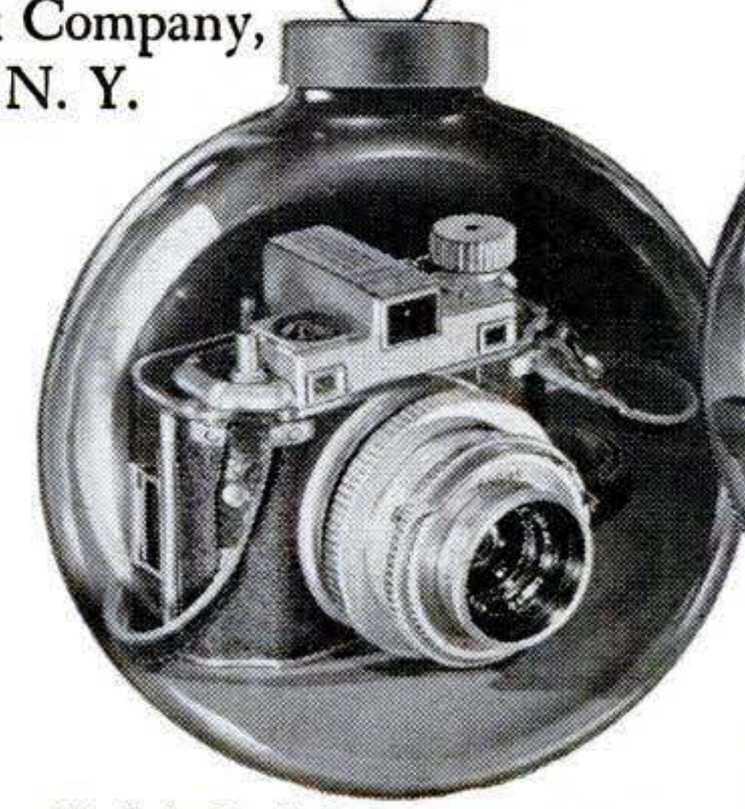

Kodak Medalist II Camera Finest lens in the 2¼ x 3¼ field—Kodak Ektar *f*/3.5. 1/400 shutter, coupled range finder, automatic film stop, depth-of-field scale. $312.50. Flasholder, $11.08.

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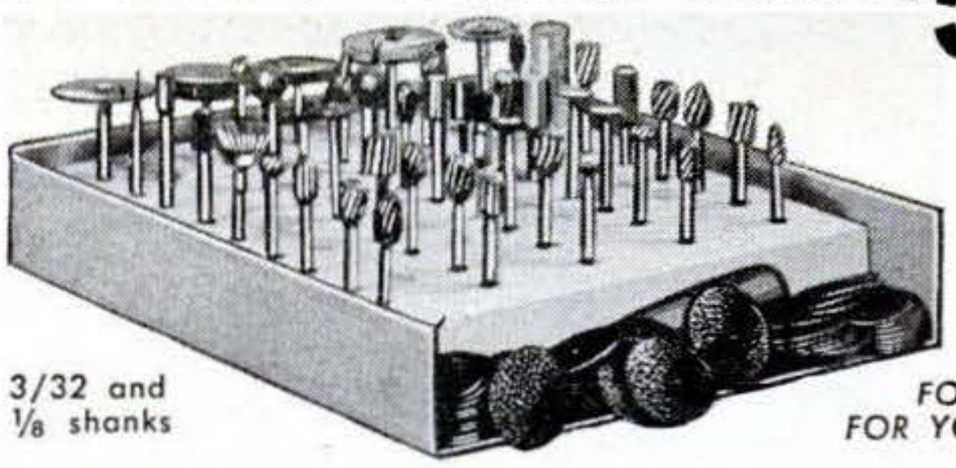

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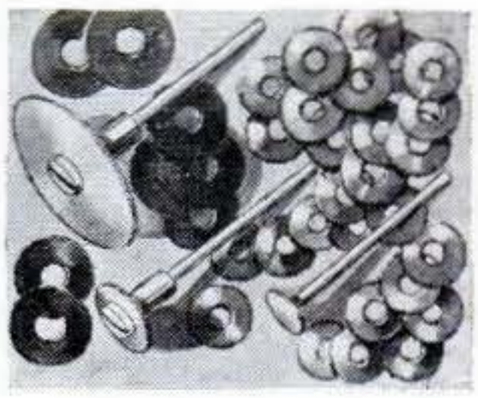

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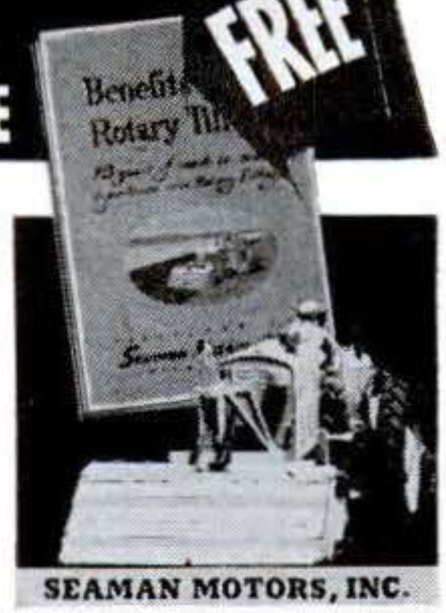

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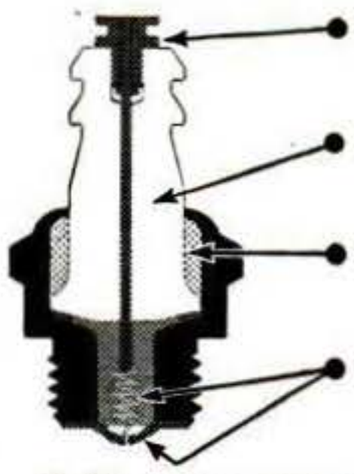

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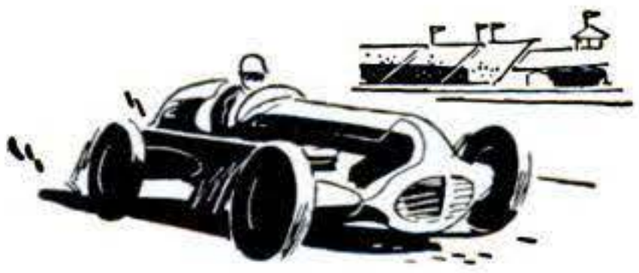

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Holland Grand Prix
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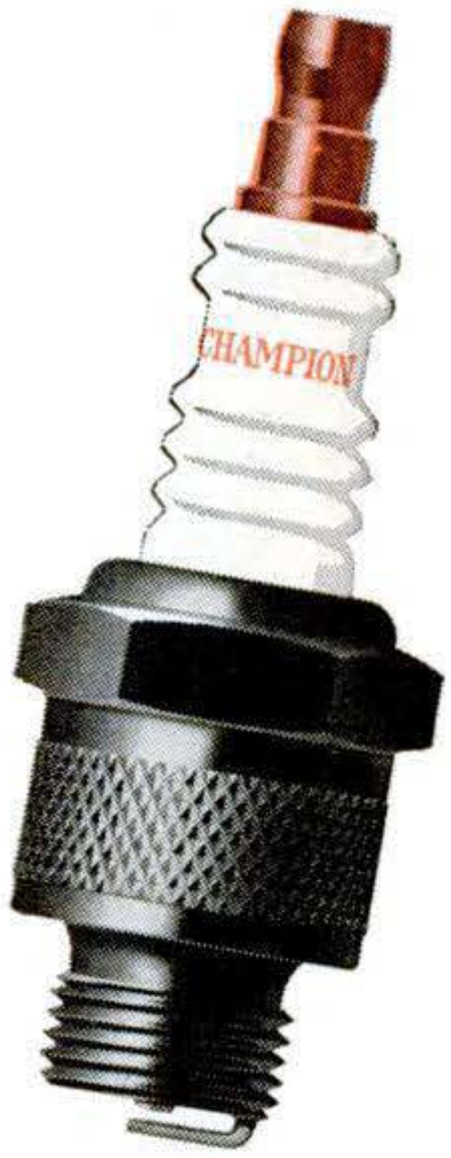

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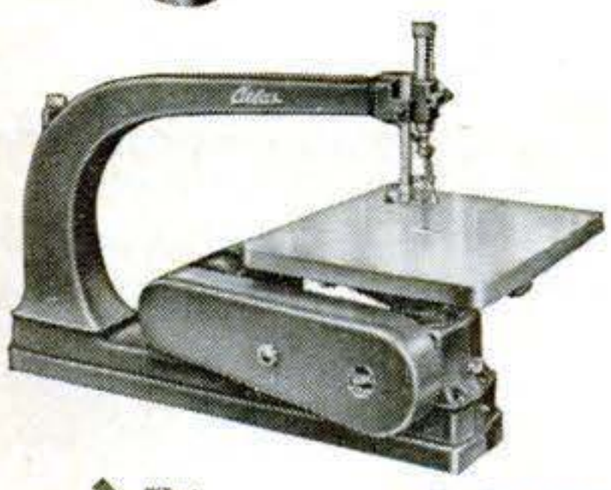
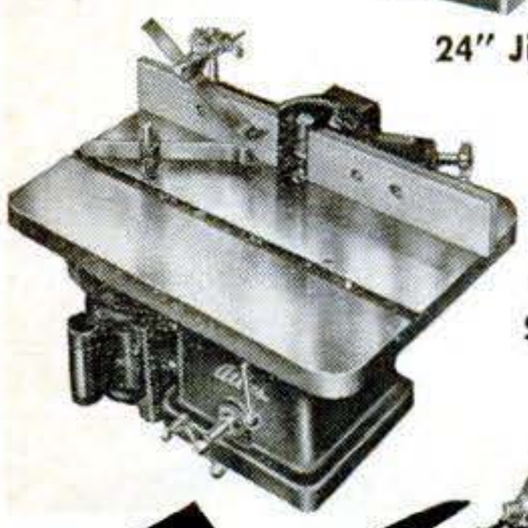

24" Jig Saw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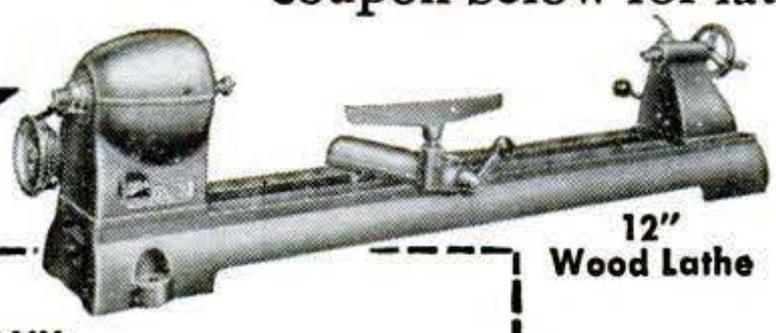
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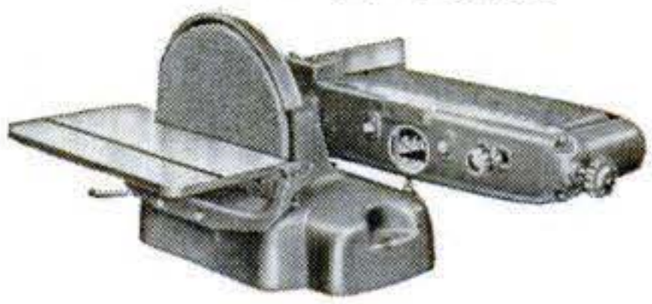
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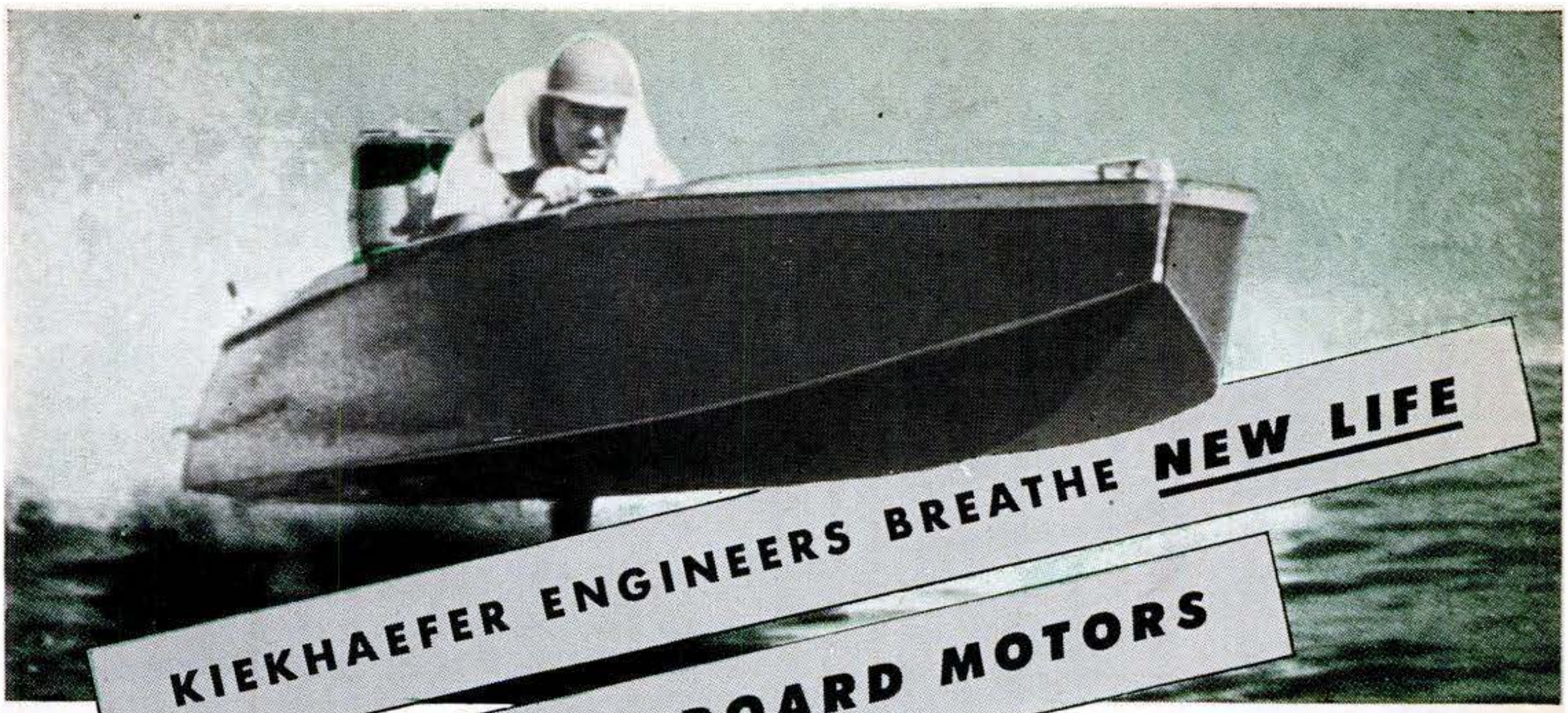

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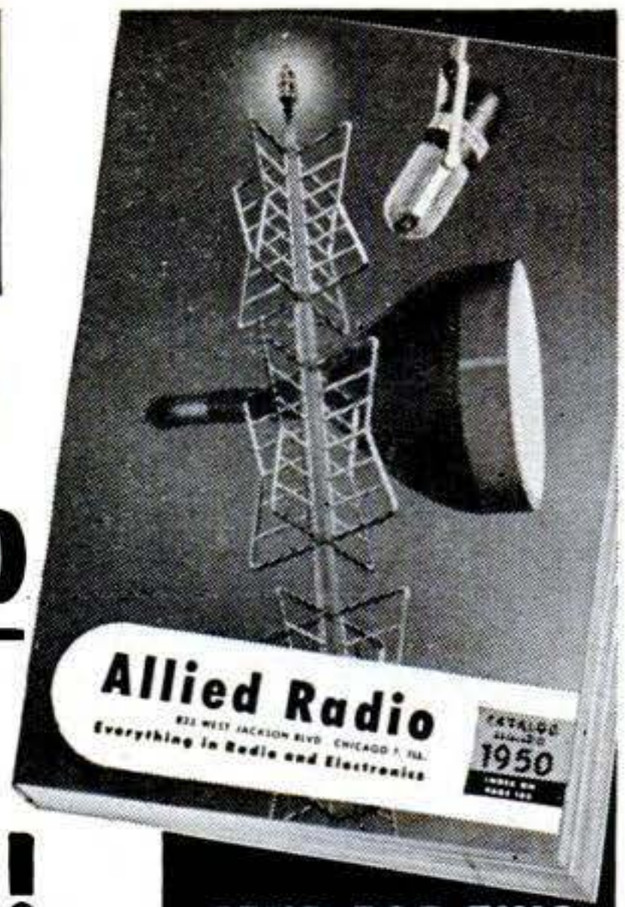

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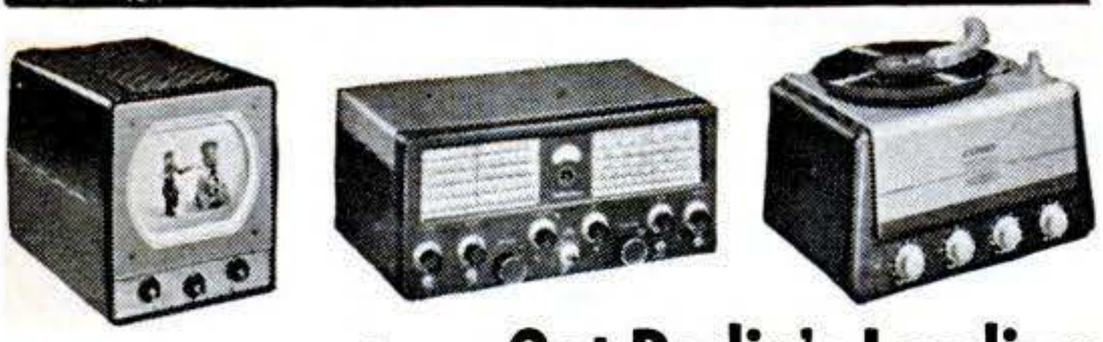

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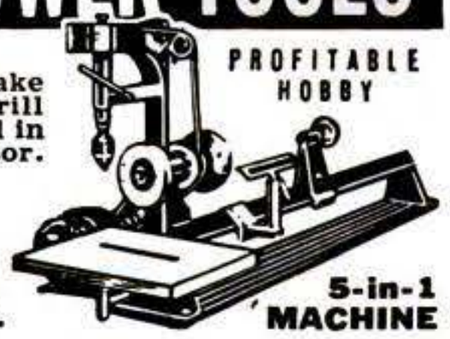

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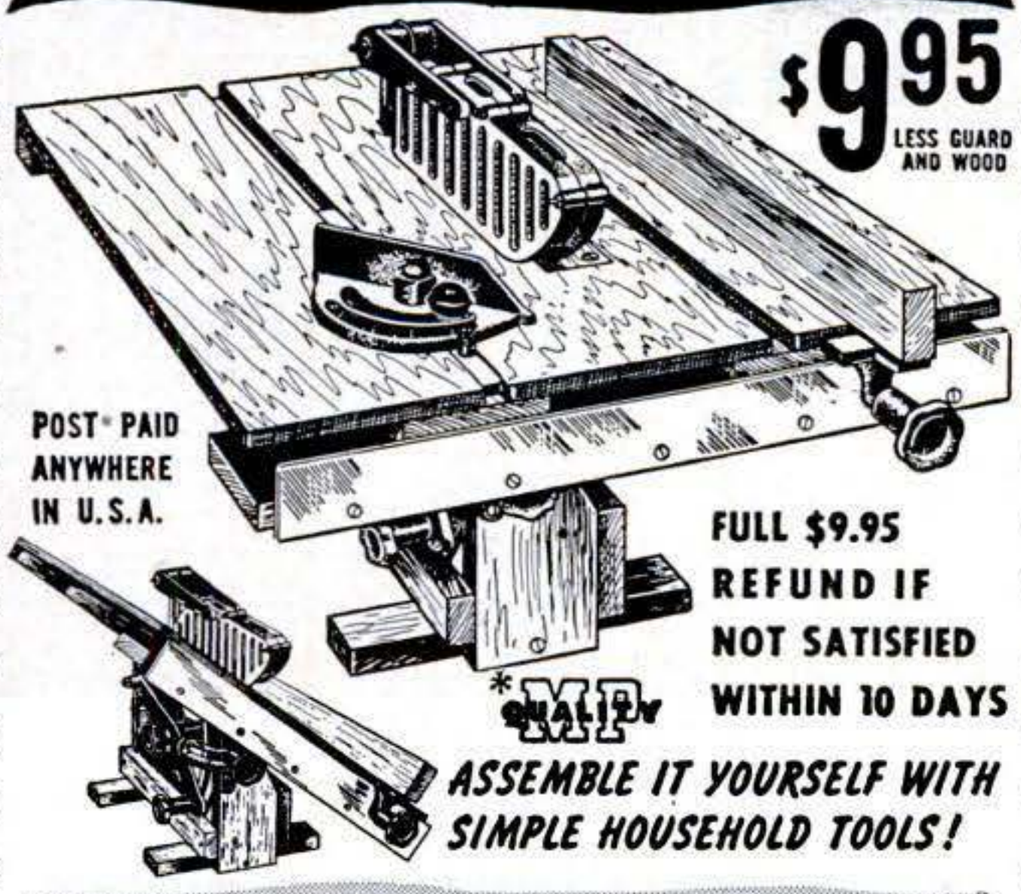

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60 LBS. OF READY MADE PARTS Only $24.95

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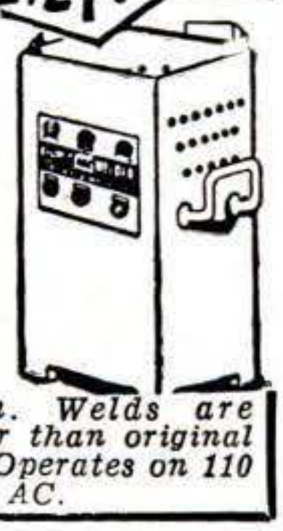

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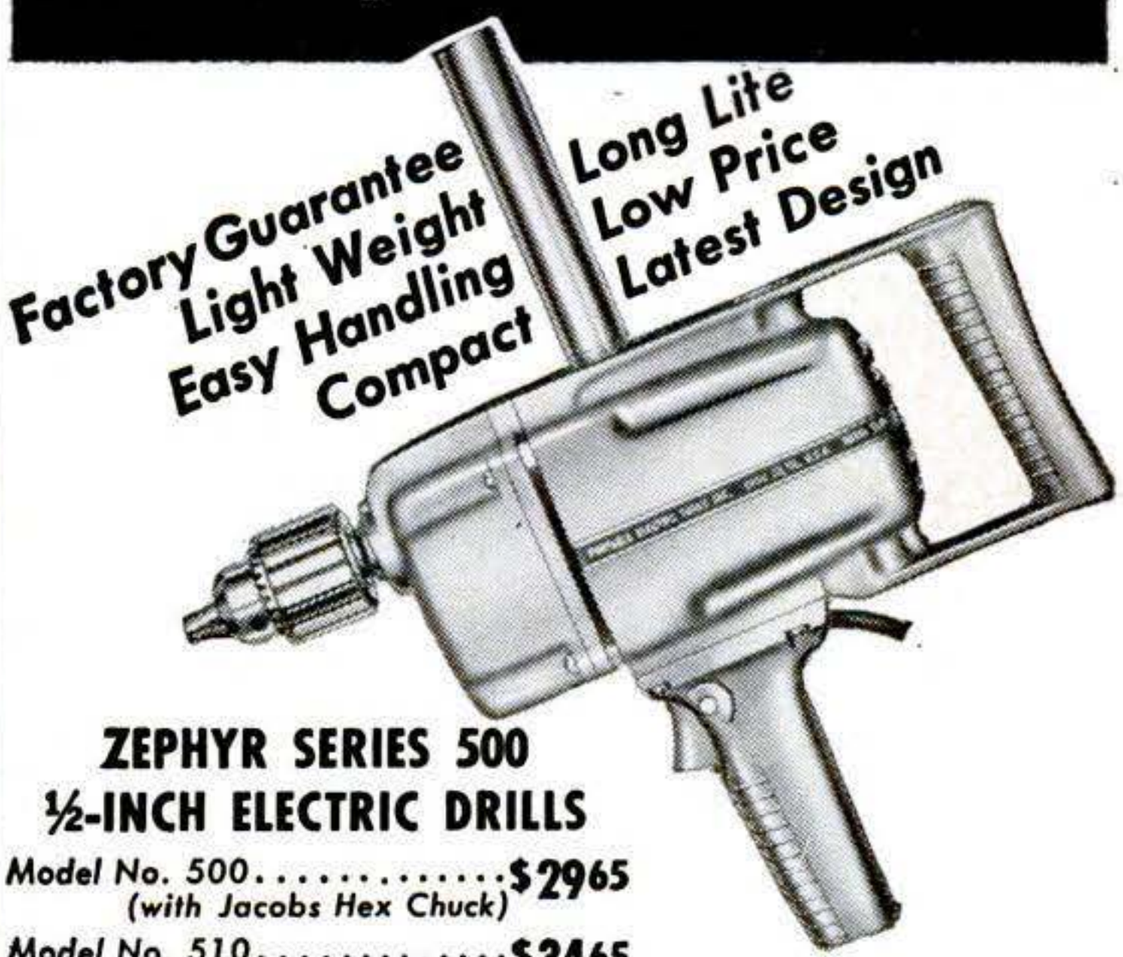

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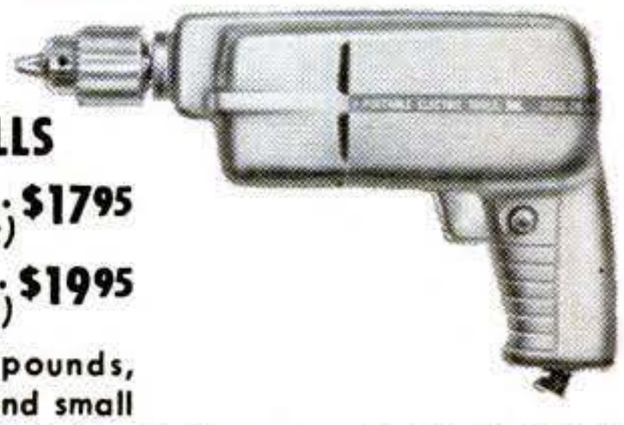
Model No. 510 (with Jacobs Gear Chuck) **$34.65**

Full ½-inch drill capacity; removable side handle for close-quarter drilling; weight complete only 9 pounds. U. L. listed.

ZEPHYR SERIES 1950 ¼-INCH ELECTRIC DRILLS



Model No. 1950-H (with Jacobs Hand-Tite Chuck) **$17.95**

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Weight complete, only 3 pounds, 2 ounces. The speed, power, and small size make it the ideal power tool; handy to use as source of power for driving drill attachments for disc sanding and polishing, cleaning paint brushes, grinding and sharpening tools, buffing, removing rust and paint with wire wheel brushes, etc. A real money saver around the house, farm and home shop. U. L. listed.

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A complete electric sprayer unit with electric motor, two-cylinder air compressor, pressure equalizer storage tank, 25 to 30 pounds pressure. Sprays paint, enamel, lacquer, insecticides, and mothproofing solutions. Easy to use—no spraying experience necessary for fine job on furniture, cars, radiators, etc. Full instructions with every unit.

See these tools at your dealer, or write direct for full information. Dealer inquiries invited.

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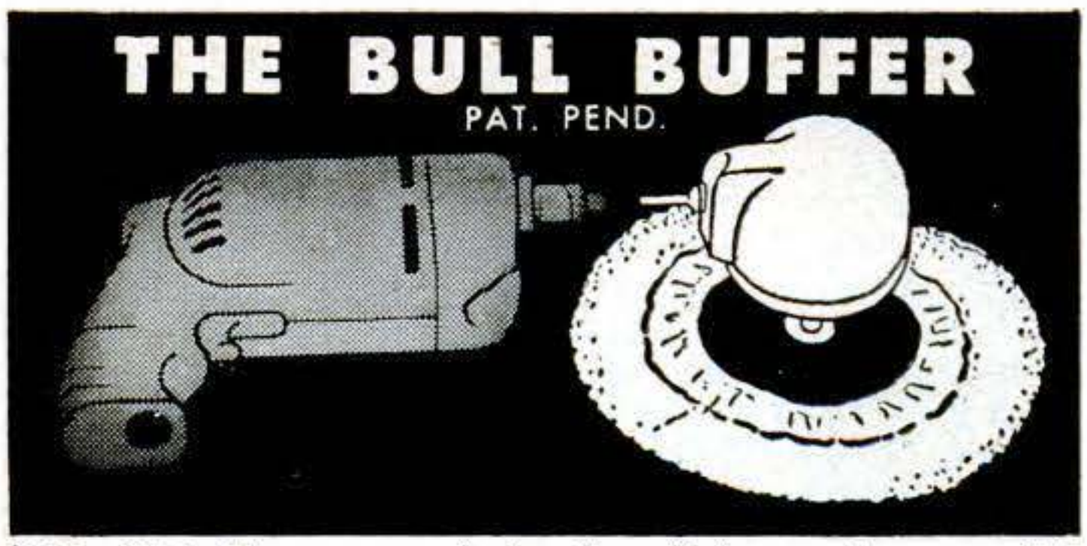
THE BULL BUFFER

PAT. PEND.



$9.95 Famous angle-head polisher-sander complete with sheepskin bonnet and 2 sanding discs. Fits the chuck of any ¼ inch electric drill. A heavy-duty, rugged tool you'll use to make your car, floors, woodwork, furniture gleam like new! It's America's First Choice—more than 100,000 in daily use. Order today!

ORDER THESE ACCESSORIES FOR YOUR BULL BUFFER

(For use with Bull Buffer only)

5¾" finest quality bark tan sheepskin bonnet, **$1.25.** 5" aluminum oxide production sanding discs (0000-00-0-1-2½-3), **$.10** each. #4 open grit, **$.15** each.

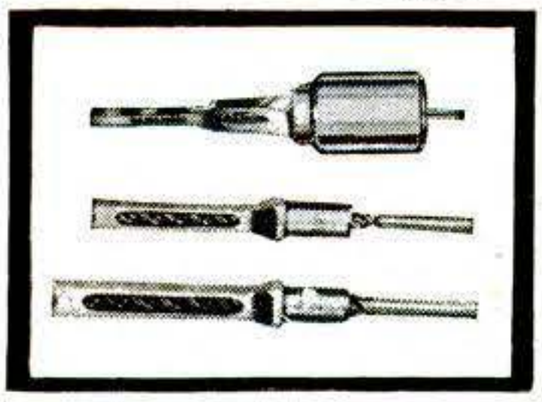
½" Jacobs Hex key chuck. When attached to the Bull Buffer, gives you angle-head drilling attachment. Increases ¼" drill to ½" capacity, provides power for heavy drilling in wood or steel. **$5.00.**

2½" cup wire brush. Easily attached to Bull Buffer angle-head. Removes paint, rust, scale, etc. **Right now! $1.75.**

NEW! Just chuck it in your drill—and watch the chips fly!

Now you can mortise **on-the-job,** now you can rout **on-the-spot** with the new Bull Mortising Adapter! This amazing new adapter can be attached in either drill or drill press in a matter of seconds, and it gives you a powerful, **portable** tool that really makes the chips fly!

NOTE: Bull Mortising Adapter is designed specifically for use in any ¼" electric drill or any drill press; it should **not** be used with ⅜" or ½" electric drills.



BULL MORTISING KIT

Includes Bull Mortising Adapter and ¼", ⅜", and ½" chisels with corresponding bits. Complete, guaranteed, only..... **$23.90**

MORTISING ADAPTER ONLY

Fits any ¼" electric drill or drill press; also fits any standard mortising bit and chisel..... **$6.95**

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Uses Standard Sandpaper Sheets!

Now you can get to all those hard-to-reach places with the new Bull Drum Sander—a **portable** 2" drum sander that fits any electric drill (or drill press.) MOST ECONOMICAL drum sander on the market because you cut your own strips out of **ordinary sandpaper sheets** instead of buying costly sanding sleeves! No wedges or screws necessary; new patented feature lets you insert and remove sanding strips at the flick of a finger. Complete, with 6 sanding strips **$2.50**

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When ordering, specify model in either standard or Phillips.

MODEL A—Self-centering model for driving screws up to #14.

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MODEL C—Without self-centering hood; long blade reaches those extra-deep counter-sunk jobs.

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Cleveland Air Hammer, E5, Pistol Grip, Cap. ¼" Rivet	12.45

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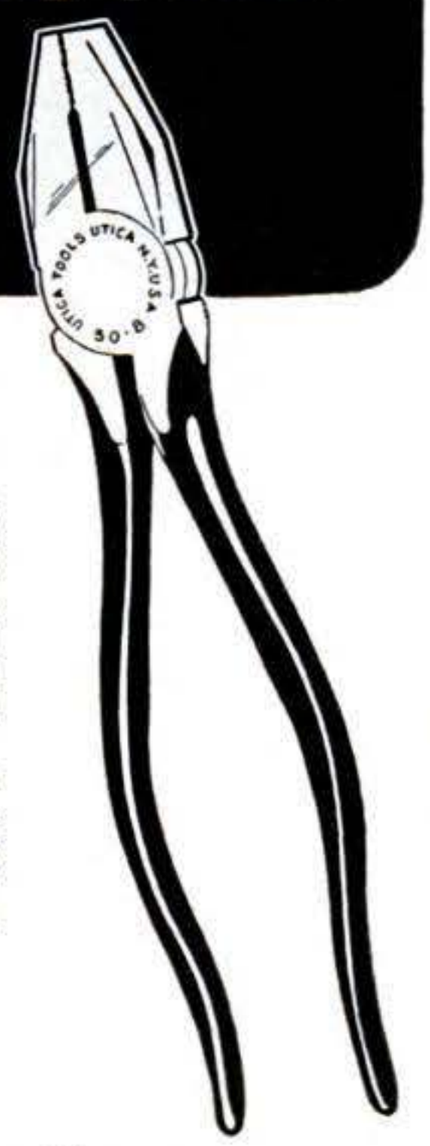

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Electricians' Standard Side Cutting Pliers
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Dial indicator-face-2¼" graduated in 1/1000ths. Dial reading-o-50-0; spindle travel—¼: can be used on stationary or revolving parts on lathes, milling machines, drill presses, etc. and for automotive work. Comes complete with dial gage, hole attachment, bar with upright, clamp sliding swivel, dial holding rod and 3 contact points—with case shown.

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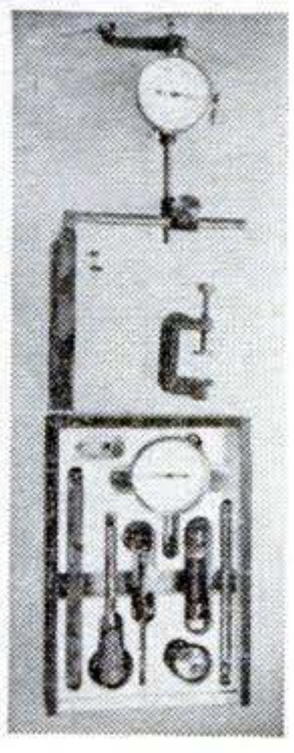
NOW **$15.00**



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IN CHESTS

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Stanley No. 51½ Nail Hammer. "Right hand" of hobbyists and home handymen.

Stanley No. 4 Bench Plane. Choice of 9 out of 10 woodworkers.

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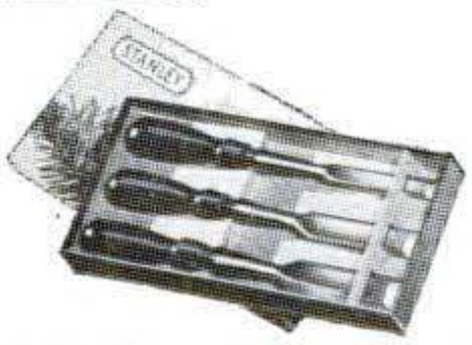

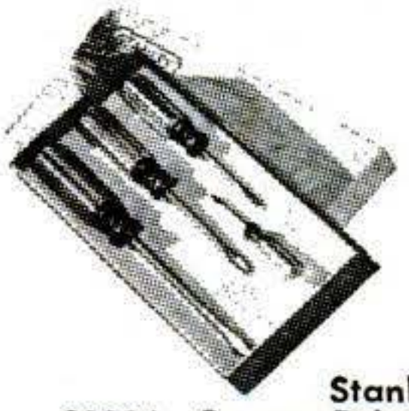

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Make any man or boy happy . . . give him Stanley Tools. Designed for expert craftsmen but priced for everyone. Sold in chests, in sets and individually. Give Stanley Tools . . . a worthwhile gift.

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Early American Designs—easy to follow. Two packets with 15 designs in each, 25¢ per packet, postpaid.

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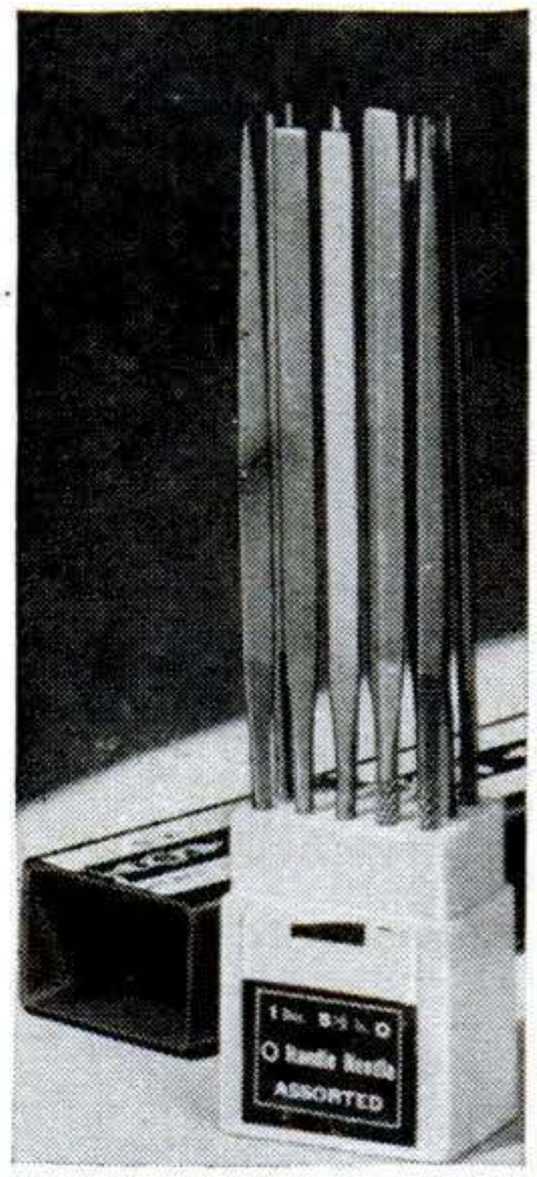
YES, if you're not getting anywhere with hints that you'd like somebody to give you one of these handsome kits of Nicholson X.F. Swiss Pattern Round Handle Needle Files for Christmas, don't wait—give yourself the treat.

"X.F.," meaning "Extra Fine," is the mark of the very highest achievement of the file-maker's art. In a beautiful orange-and-blue plastic box with bottom stand are twelve fascinating file shapes (no two alike) applicable to most every possible use in model building, clock repairing, small die making, delicate instrument fabrication, etc. They're the pride of the hobbyist and precision craftsman, and come in over-all 4"; 5½" and 6¼" lengths; in cuts Nos. 0, 2, 4 and 6. At good hardware stores.



ROTARY FILES and BURS, too, are tops for trueness, sharpness and long-lasting quality when bearing the Nicholson trade-mark. Made of high-speed steel, with files hand-cut and burs machine-ground from solid. Favorite assortments are: **ROTAKIT No. 40**—5 files and 5 burs with ¼" shank; and **ROTASET No. 88** (illustrated)—18 burs with ⅛" shank.

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BUILD YOUR OWN TILTING ARBOR SAW!

SAVE $50 OR MORE

Exclusive GIL-BILT Build-It-Yourself Features

- No machining—build easily with hand tools only
- No blueprint reading—step-by-step pictorial plans, full scale patterns, actual photographs
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- Capacity and performance of commercial saws selling for $60 and up

GIL-BILT 10-INCH TILTING ARBOR SAW

- 27x28 in. table. 13½ in. capacity in front of blade
- 10 in. blade cuts 3¼ in. deep, tilts full 45 degrees
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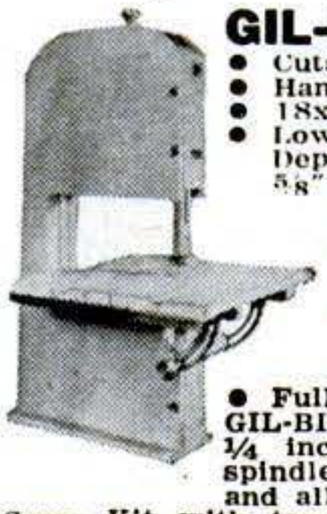
- New Departure ball bearing arbor, ¾" precision shaft turned down for ⅝" bore blades, alum. housing, shipped ready to run
- Jackscrew and 4½ in. dia. handwheel lowers and raises blade
- Cast aluminum miter gauge and self-aligning rip fence guide

GIL-BILT Metal Parts Kit includes Plans, ball bearing arbor, miter gauge and bar, rip fence guide, dado insert, lock knobs, jack screw mechanism and handwheel, and all other metal parts (less blade) **$20.95**
Same Kit with 10" Combination Blade . **$24.90**
Same Kit with 8" Combination Blade . . **$23.90**

GIL-BILT 12-INCH BAND SAW



- Cuts to center of 24 inch circle
- Handles stock up to 6 inch thick
- 18x18 inch table tilts 45 degrees
- Lower wheel and drive pulley runs on sealed New Departure Ball Bearings; Upper wheel runs on two ⅝" bore Oilite Bronze bearings.
- Upper wheel tension and tilt mechanism of cast aluminum, completely assembled.
- Upper and lower blade guides. Each has ball thrust bearing, self-lub bronze jaws.
- Rubber tired wheels. Choice of cast aluminum or make-your-own wood wheels on metal hubs.
- Uses standard 78 inch blades up to ⅜ in. wide.
- Fully enclosed mechanism for utmost safety.

GIL-BILT Metal Parts Kit includes Plans, rubber tires, ¼ inch blade, hubs for wood wheels, ball bearing spindle, tilt mechanism, guides, table tilt segments and all other metal parts **$16.95**
Same Kit with two machined ready-to-install 12" cast aluminum wheels **$20.95**

Return in 10 days for full refund if not satisfied.
(Prices include postage within 600 miles. Over 600 add 5%)
Also available—Plans and Parts Kit for 8" Tilt/Table saw. Order Plans at $1.00 each—sent postpaid anywhere in the world or write for FREE descriptive catalog.

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New Departure Self Lubricating Bearings

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(No extra charge for left hand threads)

C4—½" Pictured

B33—$5.45 PP.
⅝ x 4½ Spindle
B15 Plain Spindle
$3.95 PP.

C4—½x12½ spindle, housing 2x8, **$7.95 PP.**
C5—⅝x12½ spindle, housing 2x8, **$8.45 PP.**
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D8—1x17½ spindle, housing 2⅝x11 **$18.75 PP.**
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SHAPER ARBORS—Free literature on request.

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PAINTERS' STRIPING TOOL

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ITEM #41—2" bore, 6" stroke, double acting hydraulic cylinder. Clevis mounting at base and end of stainless steel shaft. Will lift 3100 lbs. with Logan Pump. Postpaid **12.50**

ITEM #32—Double action, 1½" bore, 9" stroke, will lift 1760 lbs. in one second with Logan Pump. Wt. 4 lbs. A $45.00 value. Postpaid..... **10.95**

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HI-PRESSURE FITTINGS for cylinders and valves at 35c ea. for ⅜" pipe and 50c ea. for ½" pipe.

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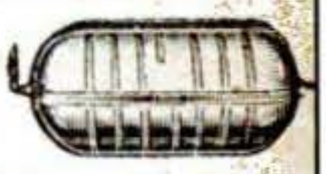
Brand New Used for heavy duty industrial applications on shop air lines or with low pressure systems. With 100 lbs. of air pressure will deliver 1900 lbs. pressure at the ram shaft. All steel construction. Adjustable cushions at both ends of cylinder. Shaft dia. 1½". Foot mounting with clevis on ram shaft. 26½" double-acting stroke; 5" bore, 40½" overall length closed, 7" overall width. 89½ lbs. net wt. Govt. acq. cost $101.85. (Item #61) AN EXCELLENT VALUE for..... **39.50** F.O.B. Chicago

G-I STAINLESS TANK



Use these tanks on compressors, for tire inflators, pulsation chambers, floats, buoys, hydraulic reservoirs, fluid and milk containers, fuel containers, etc. Tough light, shatterproof. 450 lbs. P.S.I. Aviator's Breathing Oxygen bottles, type G-I. 2100 cu. in. (approx. 9 gallons) int. vol. 24"x12". ¼" threaded openings at ea. end. Wt. 19 lbs. (ITEM #63) Price F.O.B Chicago **4.95**

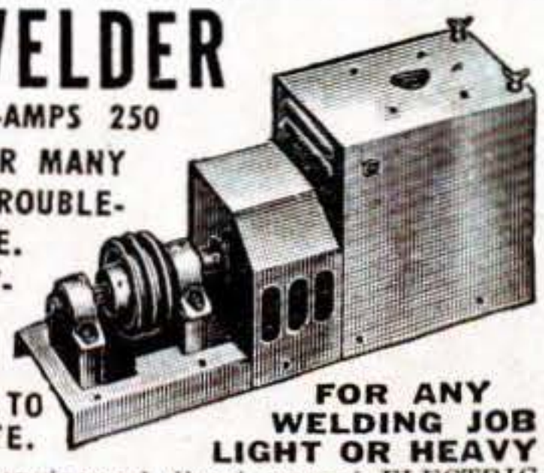
LOGAN HEAVY DUTY OIL Hydraulic Control Valve

BRAND NEW control valve with built-in adjustable relief valve, will operate one double-acting hydraulic cylinder or two cylinders as one or a reversible hydraulic motor. Valve handle latches in neutral position. Made of rugged cast aluminum alloy. Open center unloads the pump in neutral position—Throttling control allows operator to regulate the speed of movement of the hydraulic cylinder or motor. Has removable mounting brackets with 4 bolt holes, ⅜" pipe thread connections. Overall dimen.: 12½" H x 8½" D x 8" W. Ship. wt. 17 lbs. Govt. Acquisition Cost over $100.00. (ITEM #37) An Excellent Buy for..... **21.95** F.O.B. Chicago

ARC WELDER

MODEL 252—AMPS 250

DESIGNED FOR MANY YEARS OF TROUBLE-FREE SERVICE. HANDLES ANYTHING FROM LIGHT GAUGE SHEET METAL TO ½ INCH PLATE.



FOR ANY WELDING JOB LIGHT OR HEAVY

This precision-engineered direct current ELECTRIC ARC WELDER is offered at but a fraction of its original value. It can be mounted permanently or easily transported for portable use. Does the job instantly, where and when you need it.

The War Surplus generators for these Arc Welders were built by General Electric, Westinghouse, and Delco-Remy at a cost of over $300.00. They are light in weight; have oversized lifetime grease-sealed ball bearings; air-cooled commutator; dial type rheostat for easy pinpoint control; high-low range switch; reactor coil for even arc; handles 1/16 to 3/16" rods. Run welder at 2500 R.P.M. from drive pulley or power take-off of tractor, a 7½ H.P. electric motor or a 10 H.P. gas engine. Use one or two V-belts, or flat belts (on pulley). Continuous welding rating—200 amps., intermittent rating—250 amps.; 0-40 volts. Now . . . AT A FRACTION OF ITS VALUE. Price includes double V or flat belt pulley and instruction book. Ship. wt. 95 lbs. Only one or two jobs will pay for entire welder. (Item #65) F.O.B. Chicago **99.50**

ACCESSORY KIT including welding helmet, electrode holder, two 10 ft. cables with clamp, and 5 lbs. of assorted welding rods. (Item #66) F.O.B. Chicago **10.50**

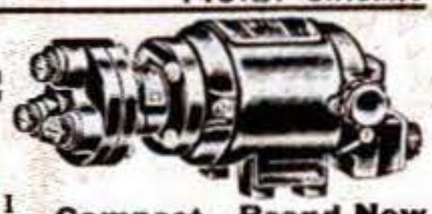
Remember, Satisfaction is Guaranteed

BRAND NEW GEAR TYPE INSECTICIDE PUMP

All Manganese Bronze for spraying D.D.T., 2,4-D, Sulphur Compounds, Etc. Pressures up to 200 lbs. and 14 gallons per minute—at 1200 RPM. Will not rust, pit, foul or freeze up. Use rubber hose inlet, ¾" pipe outlet. Equipped with double mounting brackets. Wt. 24 lbs. Dimen. 8" x 7" x 10". Standard 1" manganese bronze shaft with keyway. U. S. Gov't. Acquisition cost $62.00.

.....NOW ONLY **15.00** (Item #50) F.O.B. Chicago

Self-Priming Electric Pump



Compact—Brand New

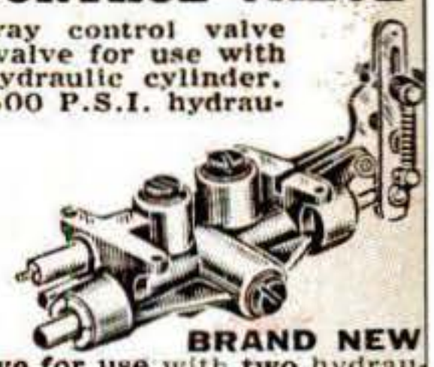
APPLICATIONS: oil burners, aquariums, fluid metering, fuel pump, tool post grinder, coolant pump, pressure lubricating pump, general industrial, etc.

MOTOR MFD. BY BLACK & DECKER; double ball bearing series wound, continuous duty 1/30 H.P. electric motor, rated 12,000 R.P.M. Transformer included for use on 110 V AC current. Also applicable for 24-32 V DC.

PUMP MFD. by WELDON TOOL CO. with standard ¼" tubing ports; rated 2 G.P.H.; remove pump and use motor as high speed grinder.

OVERALL DIMENSIONS: 7¾" long x 3¼" wide x 3¼" high. Approximate weight 5 lbs. $51.00 value (Item #1) Postpaid..... **12.95**

Hydraulic CONTROL VALVE



ITEM #24—Four way control valve with built in relief valve for use with one double action hydraulic cylinder, may be used with 1500 P.S.I. hydraulic system to open and close hydraulic cylinders. Brand new. Ship. wt. 8 lbs. A $38.00 value. Post. paid... **7.95**

ITEM #26—BRAND NEW Four-way control valve for use with two hydraulic double action cylinders. Each cylinder may be operated independently of the other or in conjunction with the other. Oil may be locked in any of the cylinders to hold the piston at any required position. Brand new. Ship. wt. 6 lbs. $60.00 value. .....postpaid **10.95**

ITEM #28—A two cylinder double action valve with a unique arrangement, allowing the operator to raise both cylinders simultaneously, to lower them simultaneously or to raise one and lower the other at any predetermined rate and speed. Brand New. Ship. wt. 8 lbs. A $75.00 value....postpaid **14.95**

CENTRIFUGAL BELT PUMP DRIVEN

Ready for use on any Liquid Pumping Need

USE it for DRAINING BASEMENTS • HOME WATER SYSTEMS • IRRIGATION • STOCK WATERING • FIRE PROTECTION • DRAINING PONDS, TANKS, etc.

Brand New

MOVE LARGE VOLUME QUICKLY

When operated at 1750 RPM, will pump 42 gallons per minute on a 23 foot head; at 3600 RPM on 52 foot head will pump 88 gallons per minute. May be run with electric motor, gas engine or power take-off on tractor.

COMPLETE ENGINEERING REPORTS AND OPERATING INSTRUCTIONS FREE WITH PUMP

Pump has cast aluminum housing—accurately machined bronze impeller vanes. Complete with mounting bracket and 3½" V belt pulley. Shaft rotates on sealed ball bearings with grease gun fitting. Has 1½" threaded intake flange, two 1 inch outlets. Use one or both, as necessary. Made for Packard Motor Car Co. for use in Rolls-Royce Merlin Aircraft engines.

GREATEST PUMP VALUE IN YEARS

Shipping weight 23 lbs. You can't beat this value at anywhere near this price. Satisfaction guaranteed. (Item #64)

INDUSTRIAL PUMPING. Complete with Pulley and Mounting Bracket—Ready for Use. Original Cost Approx. $147.00. F.O.B. Chicago **29.75**

AC LIGHT PLANT GENERATOR

115 VOLTS 60 CYCLE AC

Ideal For: Home Lighting, Hunting Lodges, Stand-by Electricity, Running all AC Electrical Appliances including: Fans, Motors, Electric Razors, Refrigerators, Incubators, etc.

(ITEM #67)

750 Watts at 1800 RPM using 1½ HP gas engine.

SUPPLIED WITH V-BELT PULLEY DRIVE

0-150 Voltmeter with Regulator, 1" shaft with keyway carried in two bearings, one bronze and one ball-thrust bearing, and packed separately to prevent damage while in transit.

Protection for emergencies to operate oil burner, stoker, freezer, water pump, and lights. These units, built to exacting Signal Corps specifications, are the answer to your lighting needs. Shipping weight 60 lbs..... **59.50**

AN OUTSTANDING VALUE F.O.B. Chicago

LOGAN HEAVY DUTY OIL HYDRAULIC PUMP

BRAND NEW . . . for operating hydraulic cylinders and hydraulic motors on tractors, bulldozers, construction machinery, lift trucks, industrial applications, etc. Delivers 8 GPM at 1200 RPM at 1000 P.S.I. using 5 H.P. Ha ½" pipe thread inlet, ⅜" pipe thread outlet ¾" shaft with flat and keyway for direct o pulley drive. Has flange with 4 bolt holes fo convenient mounting. Ship. wt. 22 lbs. Overall dimen.: 7" L x 5½" H x 5½" W. A $105.00 value. FOR ONLY **22.50** (Item #29) F.O.B. Chicago

LOGAN 4-Way Foot Operated AIR VALVE BRAND NEW

MODEL 6520 For double acting pneumatic devices. Fine for operating air vises, presses, air machinery of many types. Heavy cast construction. Threaded for ½" pipe. Dimensions of valve body: 8½"L x 5¾"W x 7½"H. Net Wt. 28 lbs. Gov't acquisition cost $42.00. AN OUTSTANDING BUY AT..... **15.00** F.O.B. Chicago (Item #59)

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BRAND NEW DROPPABLE STAINLESS STEEL AIR FORCE TANK

165 U. S. Gallons. Flush type. Complete with filler cap for 3" opening; 30" maximum diameter. 10' overall length. 110 lbs. (Item #73)

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Can be used also as floats, for piers o rafts, small boats, midget auto bodies beach markers, buoys, etc., etc.

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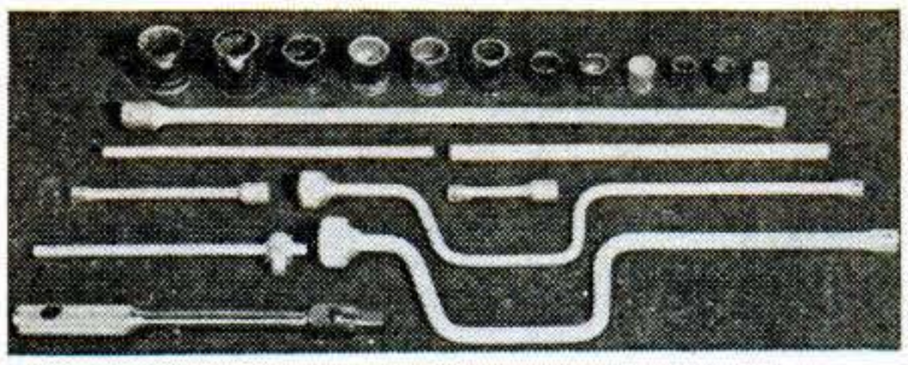
1507 S. MICHIGAN AVE., Chicago 5, Ill.

23 PIECE SOCKET SET

$20 VALUE



PRICE $9.50

Our purchase of over 200,000 wrenches as unused U. S. Airforce surplus makes this low price possible. All tools are NEW, all sockets are 12 point and plated. They are well-known popular standard makes such as Plomb, Snap-On, etc. Set consists of 23 tools. 1/2" and 3/8" drive. Shipping weight 10 pounds. This is what you get.

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- 1—5/16" Socket
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- 1—9/16" Socket
- 1—5/8" Socket
- 1—11/16" Socket
- 1—3/4" Socket
- 1—13/16" Socket
- 1—7/8" Socket
- 1—15/16" Socket
- 1—1" Socket
- 1—1-1/16" Socket
- 1—1-1/8" Socket
- 2—Bar Handles
- 1—2" Extension
- 1—4" Extension
- 1—18" Extension
- 1—T-Handle
- 1—1/2" Flex Handle
- 1—3/8" Speed Handle
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Send for FREE catalog on home utility power hand tools, electric drills, portable electric saws, etc. The best medium priced electric tools for less. We pay all postage on power hand tools.

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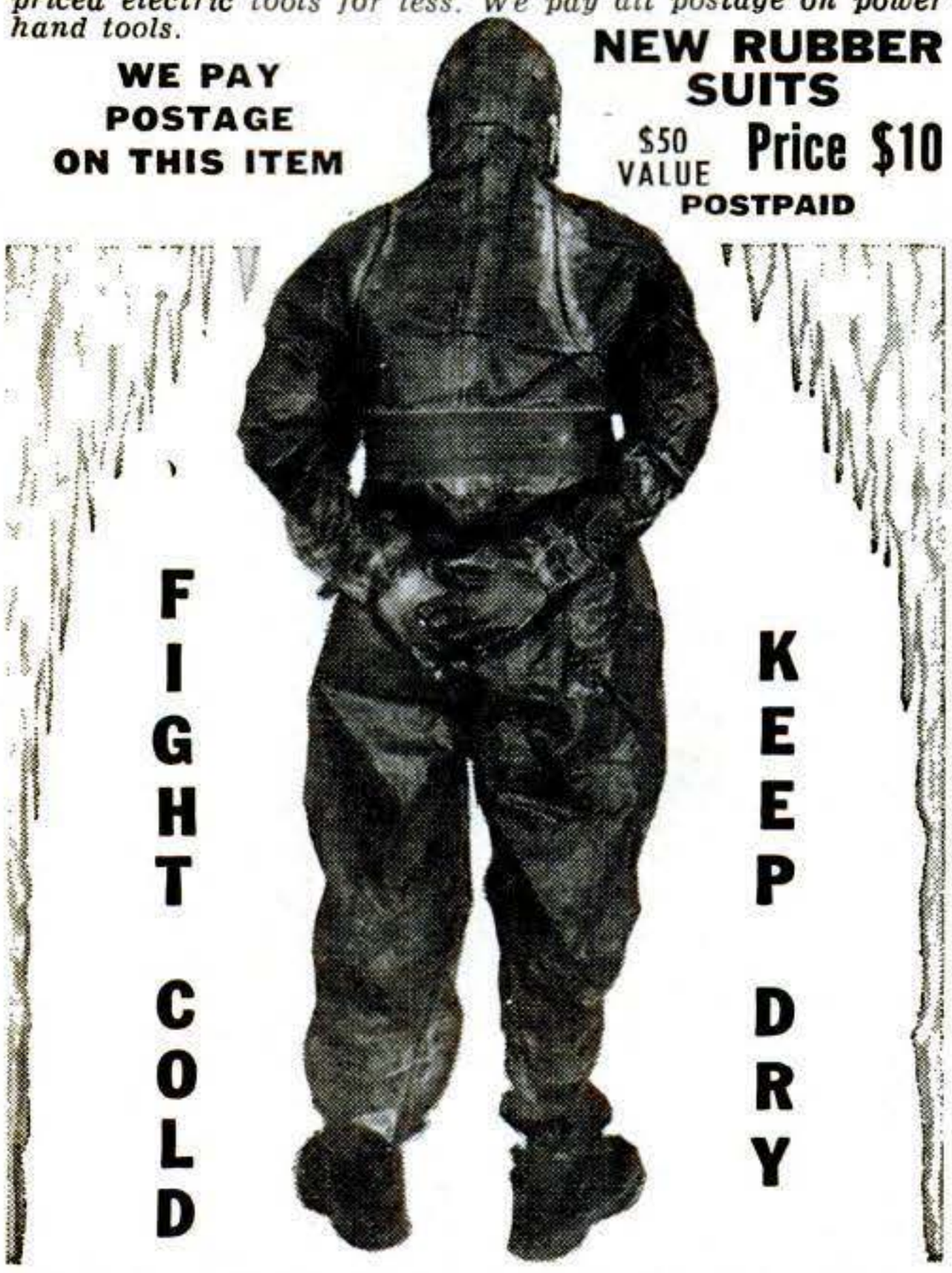
$50 VALUE **Price $10** POSTPAID



New government surplus made by Goodrich. Protects you from cold, dampness and wind, from the top of your head to the tip of your toes. FOR Duck hunters—tractor drivers—miners—flagmen—police—firemen—equipment operators—farmers—watchmen—seamen—plumbers—truckers. Good for rescue work on ice or in cold waters. With belt released a life jacket can be worn inside of suit. These suits are built similar to regular hip boots or waders. The shoes and gloves have a sure grip surface. The suit is waterproof up to the neck; it has sleeves and a hood. The rubber is vulcanized to a fabric lining. This suit is easy to slip on over your regular clothes and shoes. Sizes are all large. They have a waist belt for taking up slack. If suit is used in or near deep water use a standard life jacket inside of suit. These are the famous overboard suits made for seamen who were forced to abandon ship in freezing waters. All suits are in perfectly new condition. Color black.

All orders are filled the day they arrive. Pay by check or money order. 25% dep. on C.O.D.'s. Prices are F.O.B. Fresno, except for rubber suits, on which we pay postage. All items listed are new.

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Stop searching, get a 32 or 64 drawer Jiffy to keep those small items that usually get mislaid. Spot welded steel, gray enamel finish, metal drawer guides. Dividers included with aluminum drawers make possible three compartments per drawer. Looks good anywhere. Send check or money order, please—no C. O. D.'s. Prices below. Your money refunded if not satisfied. Dealers write for quantity discount.

SPECIFICATIONS	WITH ALUMINUM DRAWERS	WITH CARDBOARD DRAWERS
32 Drawer Unit 6" Deep 12 3/4" Wide 15 1/4" High **64 Drawer Unit** 6" Deep 25 1/2" Wide 15 1/4" High **Drawer Size** 1 1/4" Deep 2 3/4" Wide 6" Long	**Dividers and Index Cards Included** One piece rustproof aluminum drawers for heavy service — good for work bench and industry use. **32 drawer - $8.95** **64 drawer - $15.95**	Suitable for most home uses. Heavy board kraft covered. Metal drawer pulls. **32 drawer $5.95** **64 drawer $9.95**

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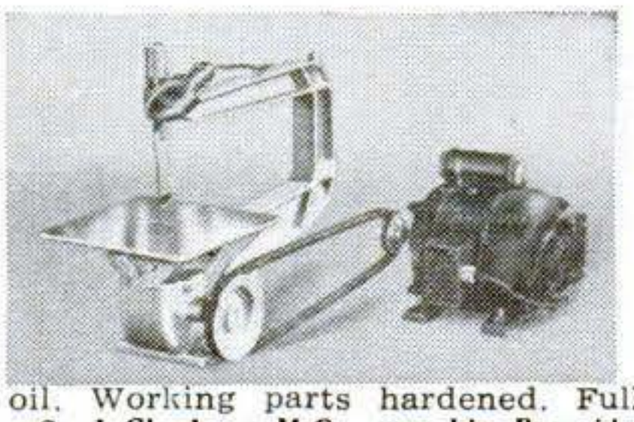

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Professional model. As Saber—upper arm removable, work not confined to throat depth. As Jig—cuts to center of 24" circle, work up to 2" thick. Table tilts 45°, grad. scale. All-metal, smooth stroke, runs in oil. Working parts hardened. Fully Guaranteed. **$13.95 ea.**

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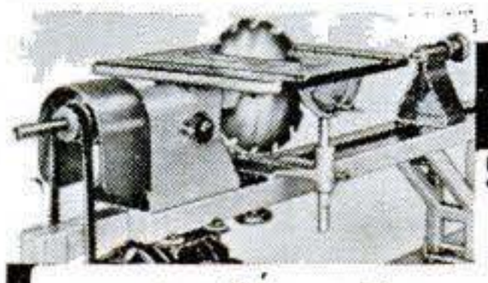
RETAIL PRICE $125.00 FACTORY TO YOU! $59.95

5 BIG POWER TOOLS in 1



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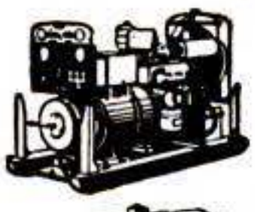

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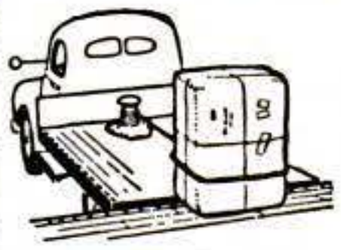

● **Welding Generators.** 275-400 Amp. Brand new. Genuine G. E. units. Ready to operate. Complete with pulley, heat control rheostat, etc. Build and repair your own machinery. Do professional work for pay. Drive with tractor, old auto engine, or electric motor. Hundreds uses. Complete with instructions on "How To Weld." **Cost Gov't over $275.00. Sale Price $89.90**

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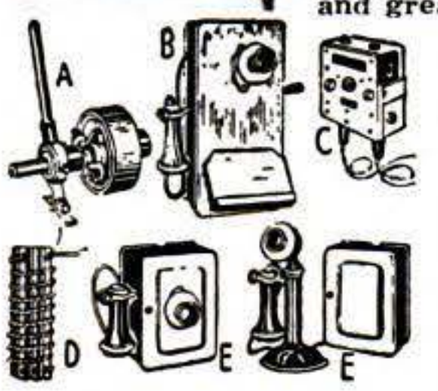

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Set of 5	Assorted	$ 2.00
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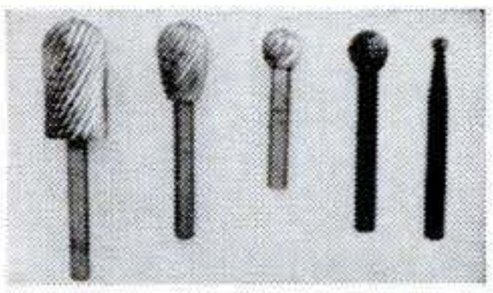

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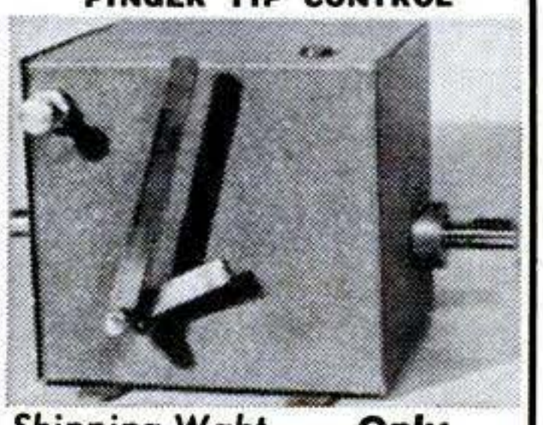

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WALLS that have become moisture-spotted because of leaky roofs have to be well sealed before being repainted. Blend turpentine and white lead to a paint consistency and mix this with an equal amount of varnish. Adding a few spoonfuls of powdered pumice improves the adhering quality of later coats. Cover the spots first, then paint the whole area with a second coat. When dry, the wall can be finished with ordinary paint without danger of the moisture seeping through.—*J. E. Bird, Carrollton, Ill.*

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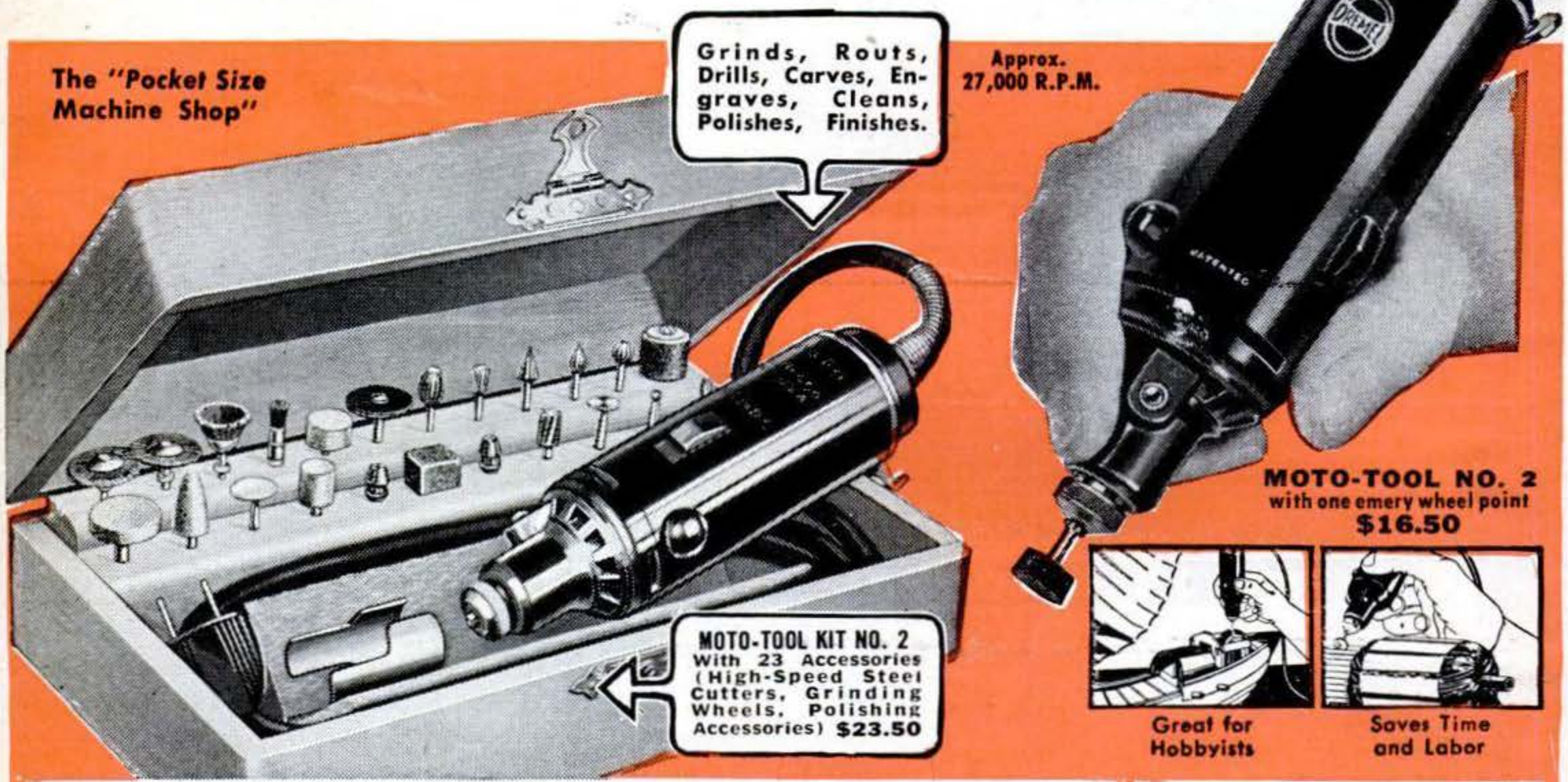
WHEN cleaning linoleum, use only mild soaps. Strongly alkaline soaps or abrasive compounds tend to soften the linoleum composition and to scratch the surface.

Shellac Protects Ball Bat

BASEBALL bats must have a finish that can really take a beating. Successive coats of shellac make one of the best ones. Use the shellac liberally, sanding lightly between coats. Then buff to a high gloss.—*Paul H. Graham, Manchester, N. H.*

THE IDEAL CHRISTMAS GIFT

DREMEL *Electric* MOTO-TOOL



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Portable
DRILL PRESS

Add all-around versatility to your Moto-Tool with this 12" high drill press. Just the thing for creating costume jewelry, model making, carving, routing, drilling, etc. Utilizes No. 2 Moto-Tool, which can be raised, lowered or swung in any direction. Weighs 3½ lbs.

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(Less Moto-Tool)

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WIDELY USED IN INDUSTRY—Moto-Tool is a precision-built electric tool, backed by over 13 years of industrial use in such plants as: GENERAL ELECTRIC • FORD • REMINGTON ARMS • NASH-KELVINATOR • WESTINGHOUSE • DOUGLAS AIRCRAFT, etc.

PRE-WAR PRICES STILL PREVAIL

MOTO-TOOL KIT NO. 2 with 23 accessories including **high-speed steel cutters** and Model 2 Moto-Tool in natural finish hardwood case **$23.50**

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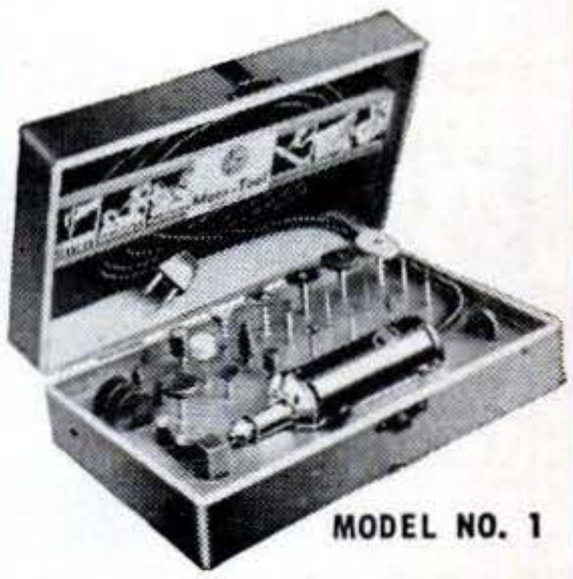

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Makes play of wax polishing

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The popular Dremel Electric Sander is more than a sander . . . it's also a polisher and massager. This miracle machine is so easy to handle, a child can use it. It delivers 14,400 strokes per minute. **(1) As a sander,** it gets into tight corners, takes the effort out of sanding walls, woodwork, furniture, workshop projects, etc. **Its straightline (non-rotary) action will not burn or scratch surfaces. (2) As a polisher,** it does a professional job on waxed surfaces of cars, furniture, refrigerator cabinets, etc. **(3) As a massager,** it's ideal for tired or sore muscles of the back, legs or arms. Users testify it is more effective than machines made expressly for this purpose.

LOOK AT THESE DREMEL FEATURES

Dremel Electric Sander does all the work . . . you merely guide it. It weighs only 2½ lbs.; it's foolproof (has only two moving parts . . . never needs oiling). Quick-change clamps firmly hold abrasives and pads. Dremel Sander is sturdily built to give long, trouble-free service. Operates on 110-120 Volt, 60 Cycle, AC. Thousands and thousands of satisfied users **prove its outstanding value.**

WHERE TO BUY IT—Dremel Electric Sander comes complete with 6 sheets assorted grade Garnet Paper for sanding, plus felt pad and sheepskin for polishing. Buy it from your dealer. If he cannot supply you, use coupon below to order direct from factory. We ship **postpaid** if you send check or money order in full. Or, send **$2** now and pay postman balance plus postage, on delivery. **Money back** if not delighted after 5 days' trial.

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CUTS SCROLLS LIKE MAGIC—SANDS AS IT SAWS

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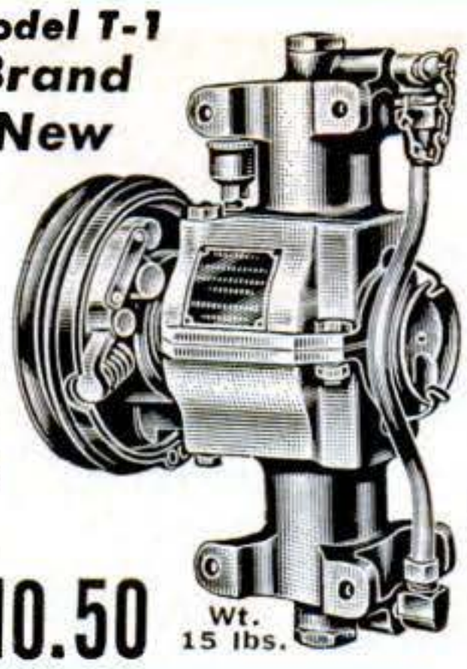

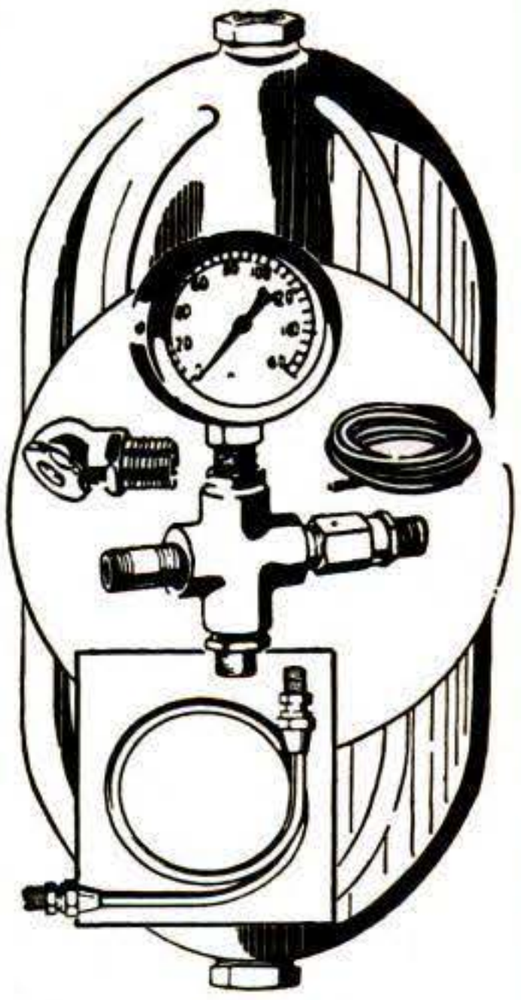

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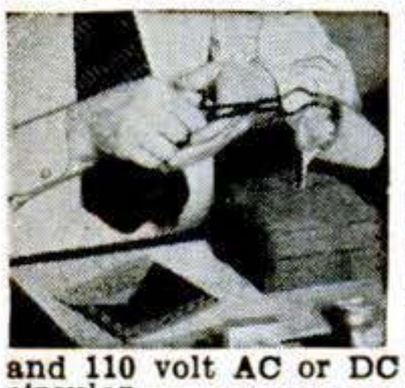

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All Cast-Iron Construction

No Stampings • No Die Casting

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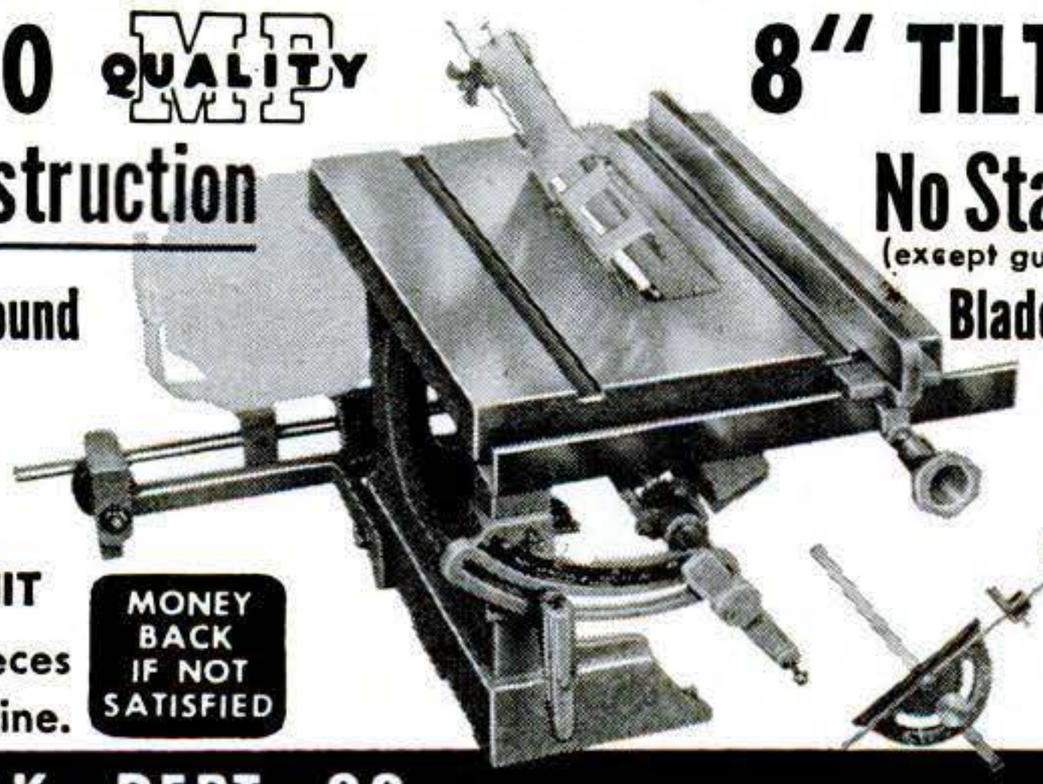

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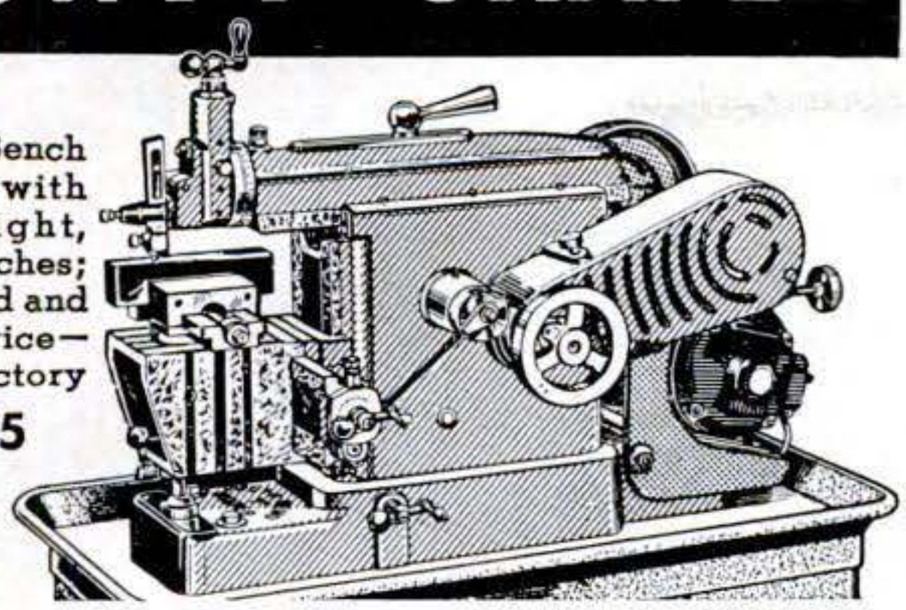

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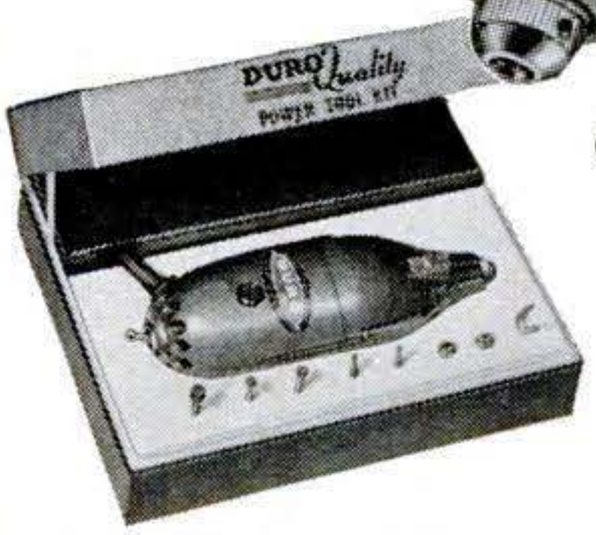

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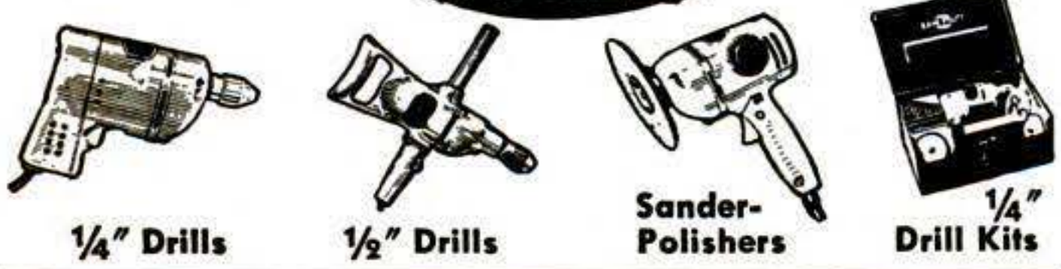

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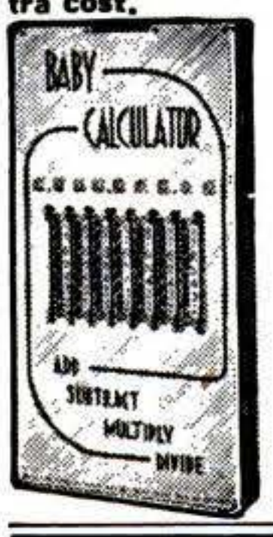

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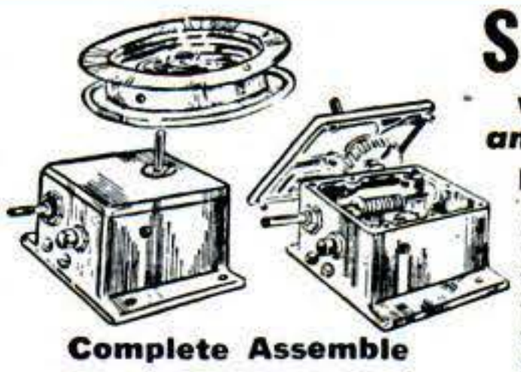

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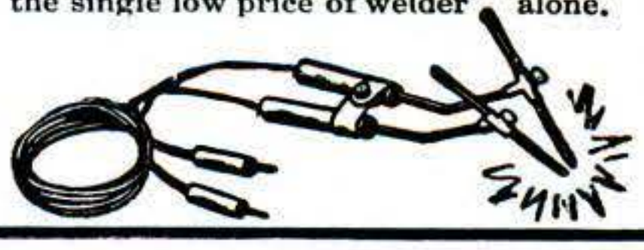

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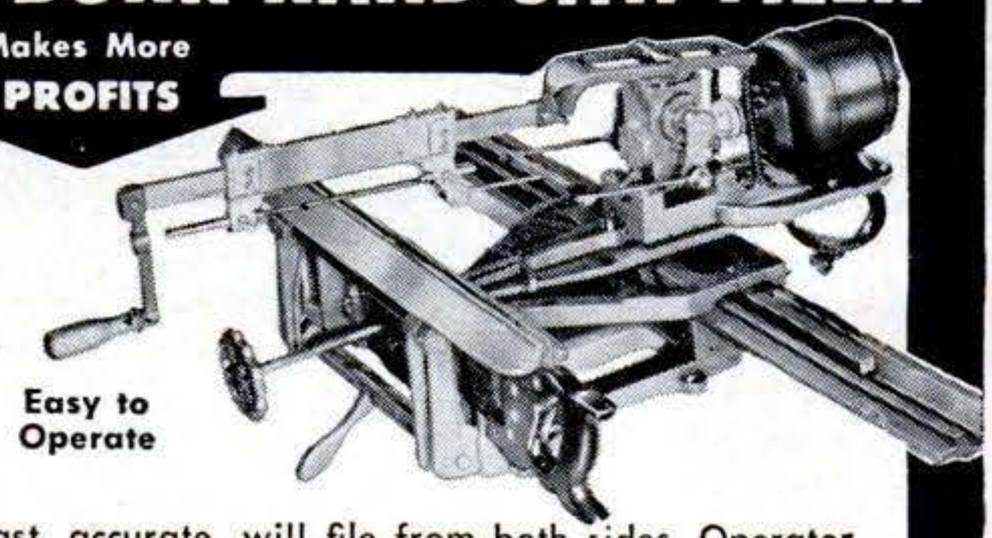

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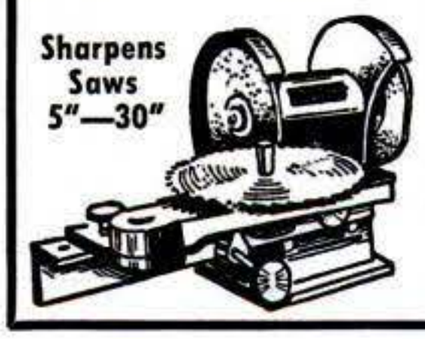

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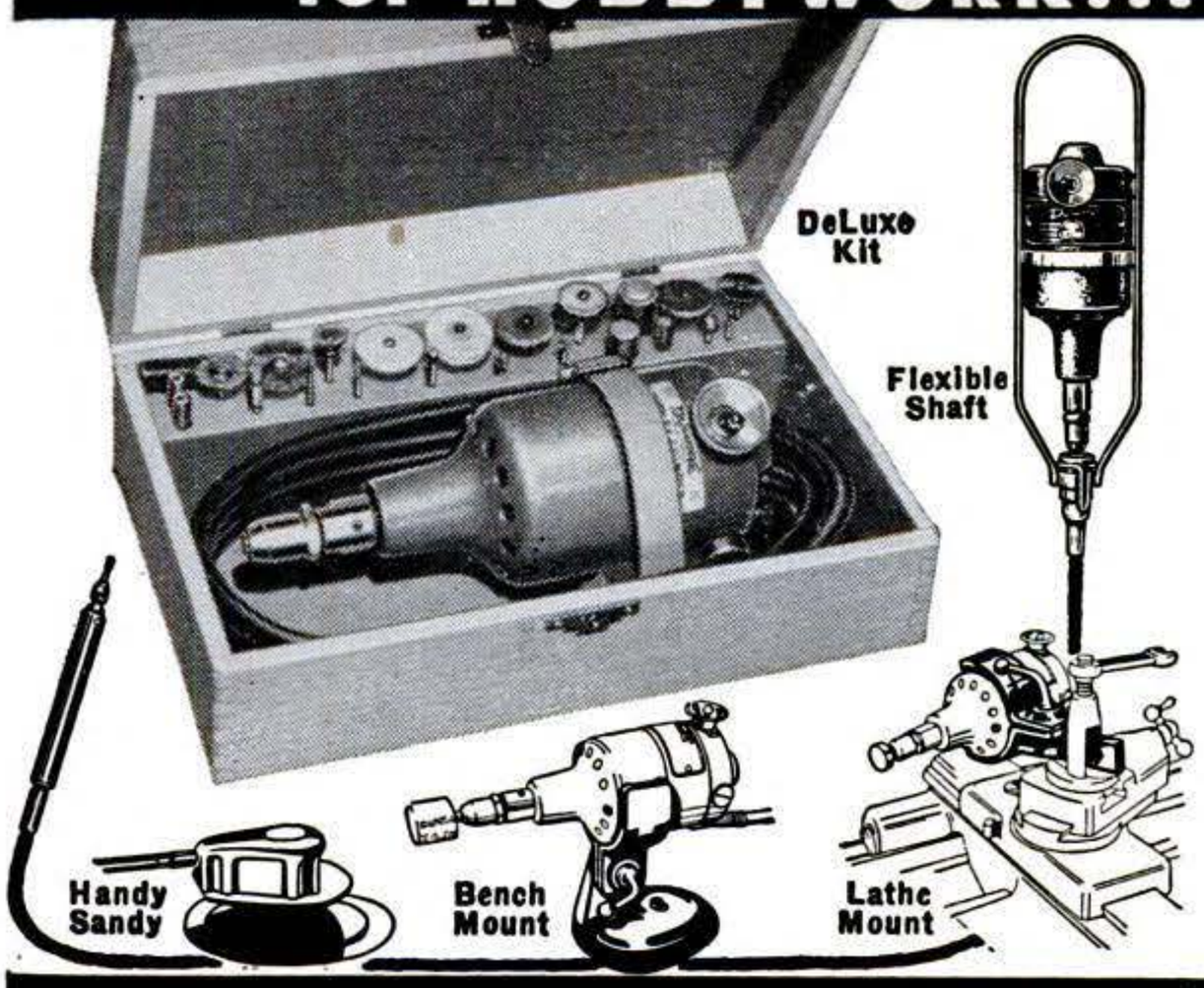

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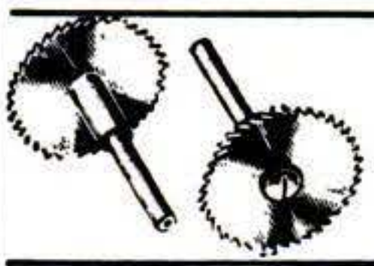

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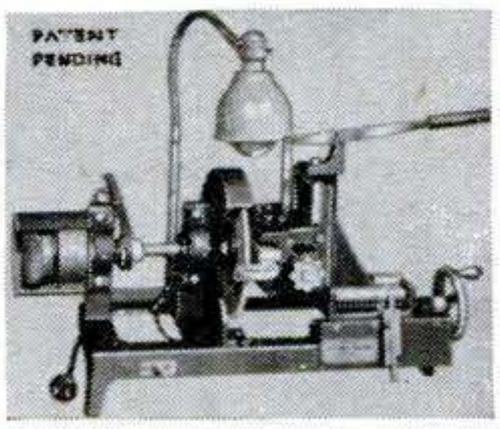

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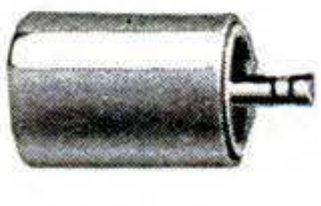

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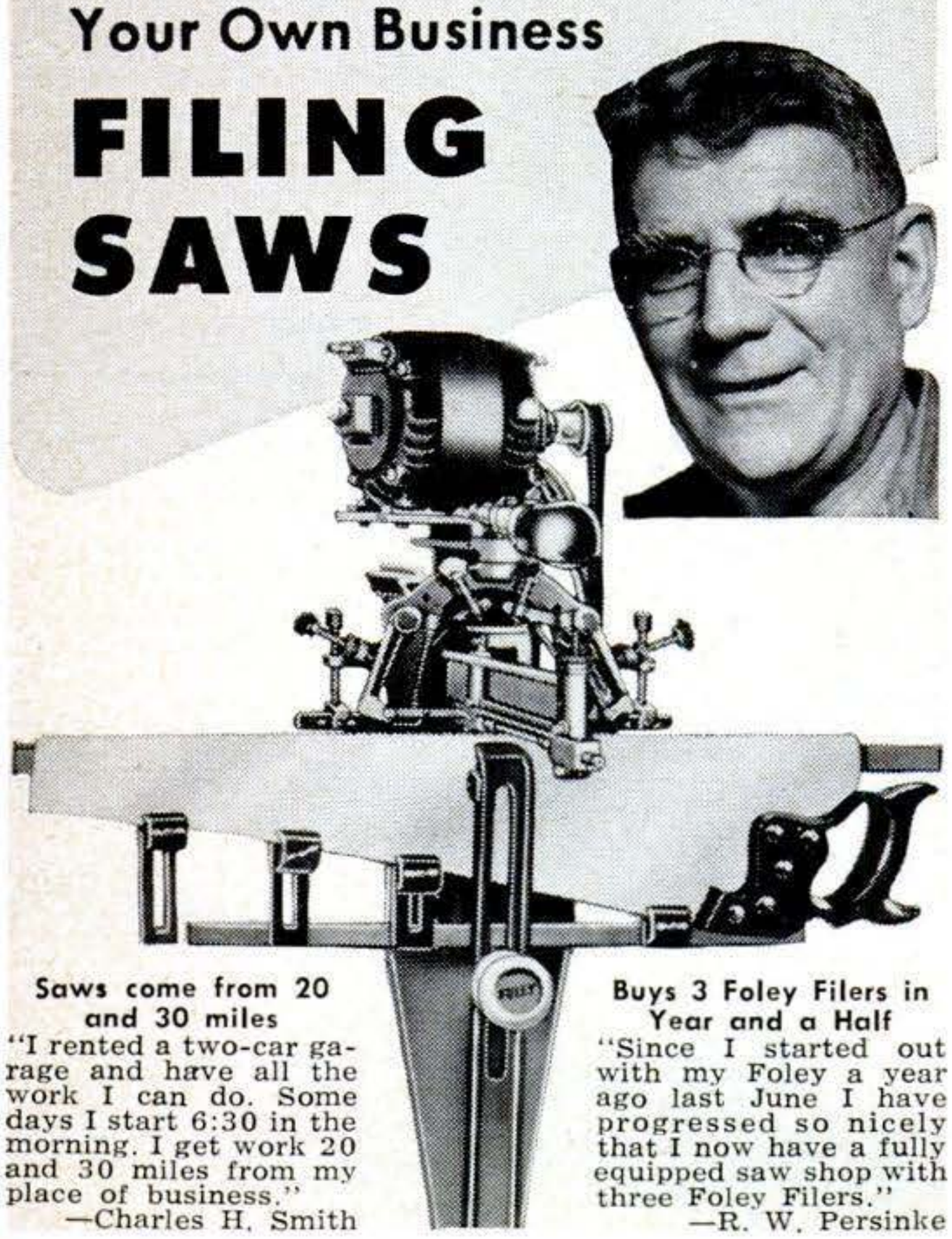
FILING SAWS



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P-1 PESCO TYPE - Positive displacement gear type. Capacity: 1 gal. per minute, at 1500 RPM at 1500 PSI. Operating speed: 3700 RPM intermittent max. 4500 RPM. Rotation: either direction with slight adjustments. **$9.49**

BENDIX HYDRAULIC HAND PUMP
Provides an instantaneous source of tremendous power for almost any heavy work. Double action stroke. Delivers .30 cu. in. per cycle at 3000 PSI. Max. press. 5000 PSI. Built-in Reservoir cap. 2¼ qts. 3/8" pipe outlets. Has Pressure Release Valve. 7¾" dia. by 23 3/16" overall ht. Weight 15.2 lbs. A $40.00 Value for...NEW **$15.95**
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Vickers Hydraulic Transmission
VT-1
Self contained, 2 H.P. constant torque at all speeds with variable volume reversible, piston pump (controlled by outside lever) supplying piston hydraulic motor. Automatic pressure, dash pot for smooth control. Power output R.P.M. - 0 to 1/3 input R.P.M. in both directions. Input R.P.M. 1800 continuous 4000 intermittent. Dash pot can be removed for greater R.P.M. Ideal for Lathes, Duplicator Setup on Mills, Conveyors, Small Cars, Drives, Gearing, etc. COST GOV'T APP. $400.00. **$19.50**

4" SPLINE SHAFTS for input and take-off . . . . . **$1.50 PR.**

GEAR BOXES VTG-1 – 90°, bevel gear 1½ to 1 reduction, size 7" x 6". A Lifetime Value. **$3.95**
VTG-2 – Inline spur gear 16 to 1 reduction, thru 4 gears. Final take-off 4½" dia, 26 tooth. ¾" Alum. spur gear. . **$6.49**
Both above gear boxes have lever control for engaging & disengaging positive clutch. Dust proof housing. Prelubricated bearings. Both can be adapted to Vickers Transmission.

VALUABLE GEAR BARGAINS!
8 to 1 ratio, spindle drive #110 . . . . . **$2.98**
6 to 1 with screw shaft #111 . . . . . **$4.98**
85 to 1 (can be used for radio, antennae, etc.) . . #112 . . **$3.95**
G-11 - 10-1 gear ratio **$3.95**

ELECTRONICS TRANSMISSION GEAR TRAIN
GT-1 Containing approx. 50 Bronze Spur & Pinion Gears– ranging from 3/8" to 4" dia., 5 sets of 7 cluster gears, 2 complete worm & worm gear drive sets, 40 N.D. ball bearings from ½" to 1½" dia. watch springs, bushings, posts, face plates, housings – Micro Switches, 2 minature, controlled clutches, etc. 19 lbs Of Pleasure and profit. A Tremendous Gadget Mine. ONLY **$8.49**
Gears in above train are all in multiple size and sequence with identical teeth ratio giving hundreds of ideal gear reduction conbimations.

Order from this Ad. All sales final. All Prices F.O.B. Los Angeles. Pay by M.O. or Check. P.O.'s Accptd. from D & B. firms. ½ deposit with C.O.D's.

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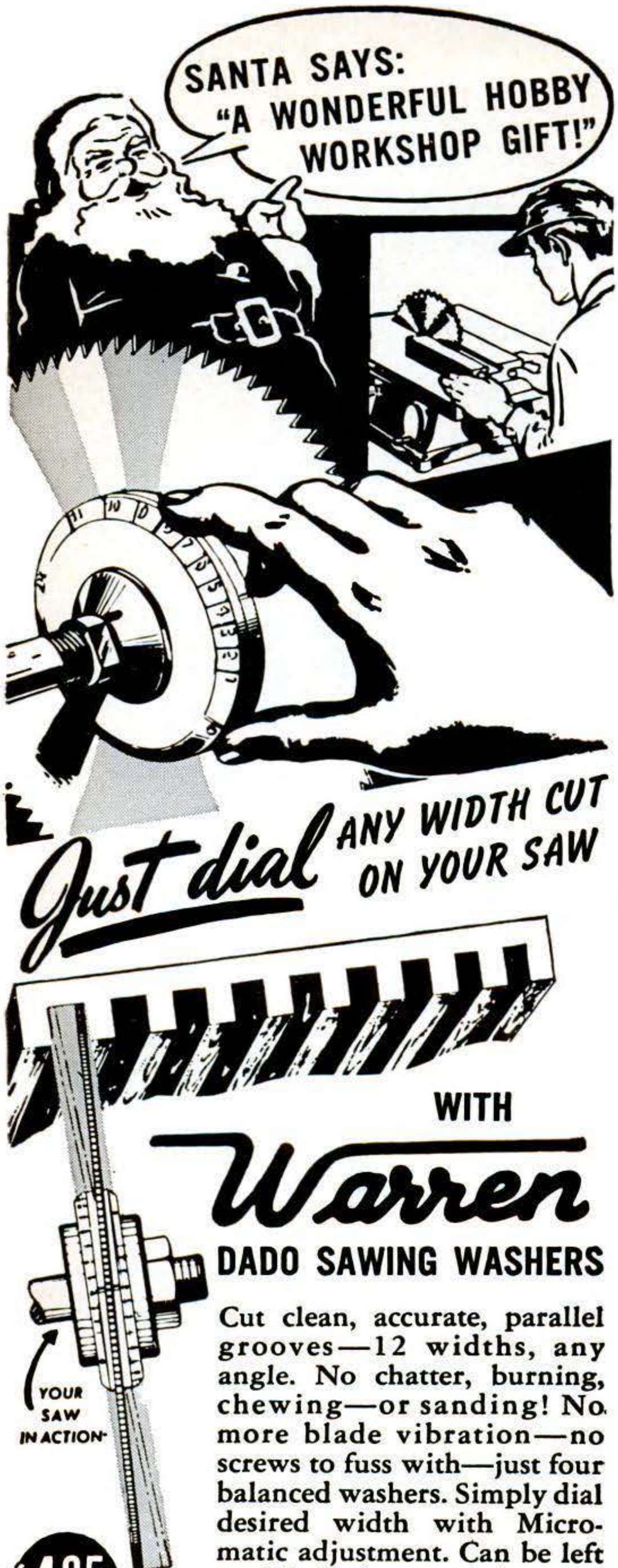

Cut clean, accurate, parallel grooves—12 widths, any angle. No chatter, burning, chewing—or sanding! No more blade vibration—no screws to fuss with—just four balanced washers. Simply dial desired width with Micromatic adjustment. Can be left on blade for straight cuts. Available in 5 sizes—½", ¾", ⅝", 1", 1⅛". A perfect gift for woodworkers. See your dealer or write—

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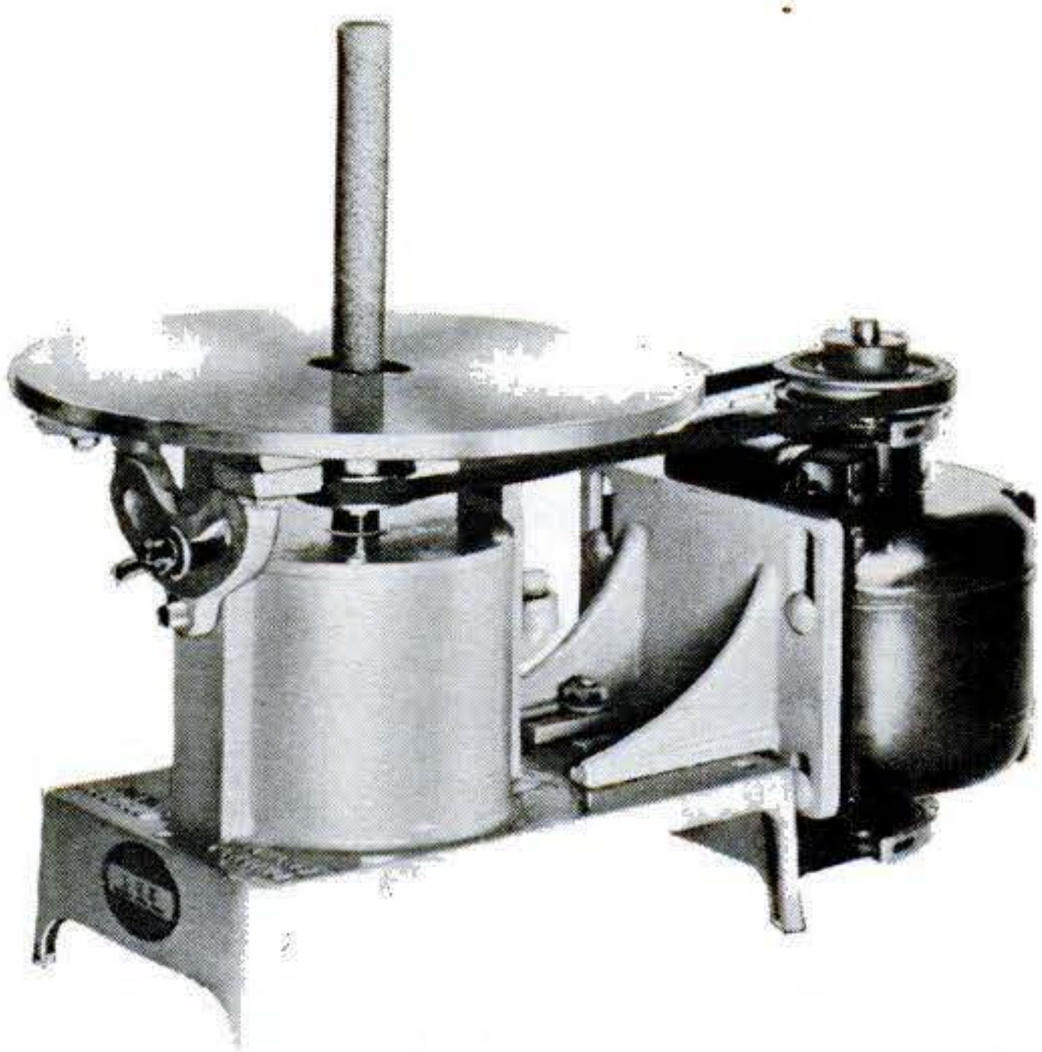
New



Oscillating Spindle Sander. Priced at about $50—motor extra—the Lux Junior® is made of cast aluminum with a two-way tilt table 11" in diameter. The base measures 6" by 12". A 1,725-r.p.m. motor turns the spindle at 3,400 r.p.m. The stroke is ¾". It'll sand inside holes as small as 5/16" in diameter as well as convex or concave curves to ⅛" radius. The maker is Minneapolis Machine & Tool Co., Minneapolis.

New Lightweight Drill. This ¼" drill, made by Fasco Industries, Inc., Rochester, N. Y., weighs only 3½ lb. The over-all length is 7¾". It retails at about $20 and operates on either 120 volts AC or DC.

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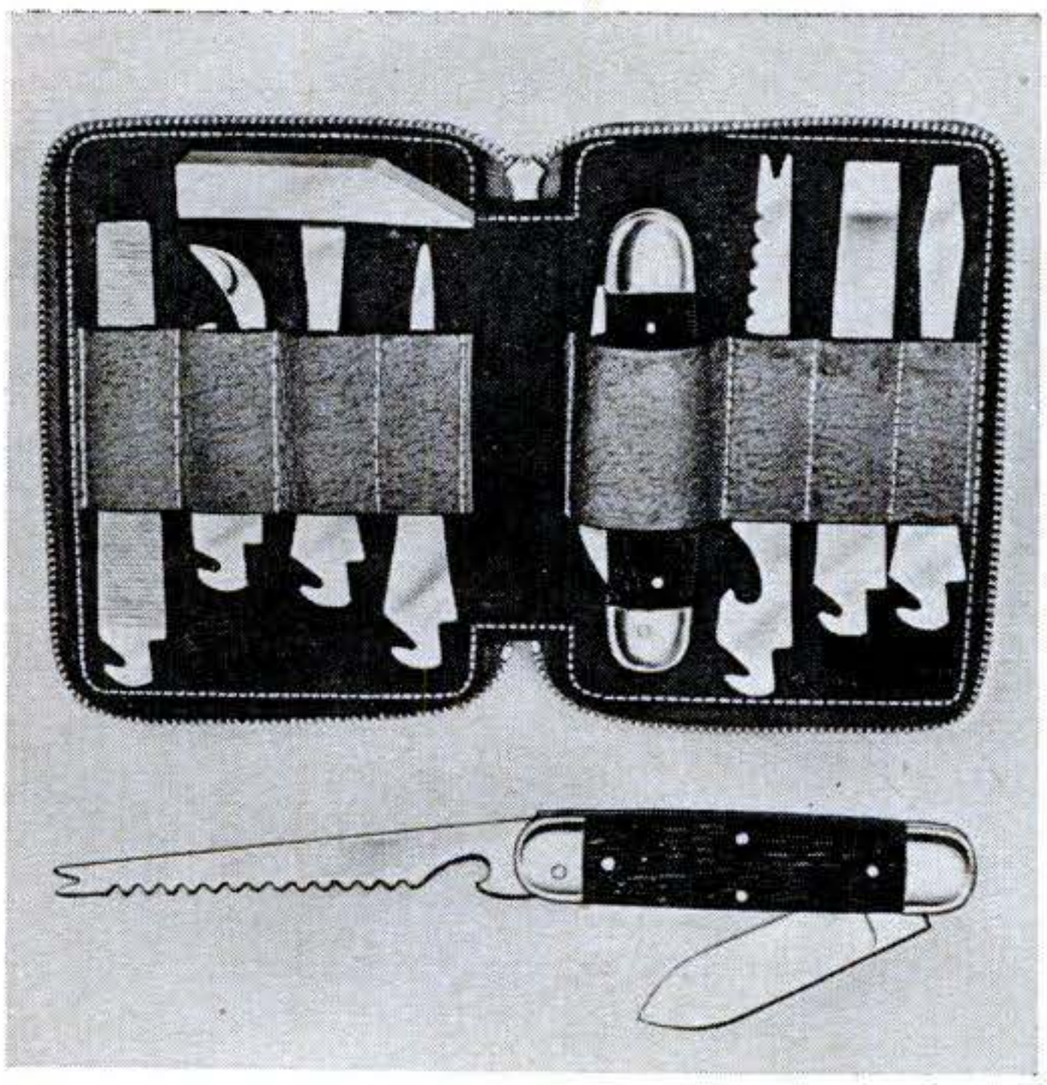
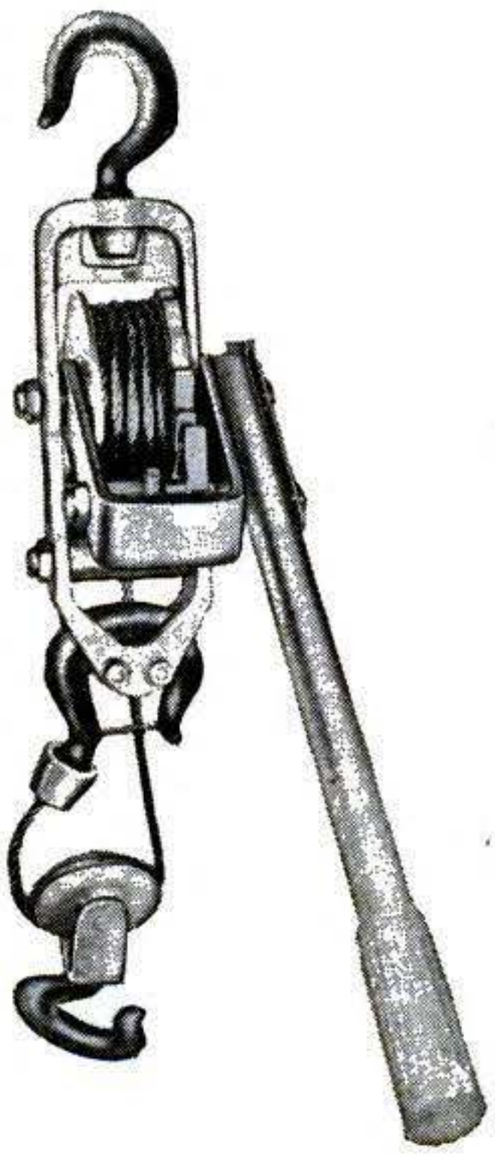
Tools



Kit Holds Eight Tools. For minor repairs and fix-it jobs, this handy 4″ by 5″ cowhide case holds eight polished-steel tools—a knife, hammer, combination can opener and caplifter, awl, chisel, screwdriver, file, and hook disgorger. It's priced at $8.50 by Hoffritz Cutlery, New York City.

Lifts 1½-Ton Load. The Lug-All® hoist weighs only 8½ lb. but it can move a 1½-ton load 7½′ or a ¾-ton job for 15′. In case of accidental overload, the 20″ reversible handle will bend before any part approaches its breaking point. It has a built-in snatch block and three swivel hooks. The hooks permit work around corners or in close quarters with as little as 10½″ between hooks. It's priced at about $30 by the Lincoln Precision Machining Company, of North Grafton, Mass. Aircraft-type cable is used.



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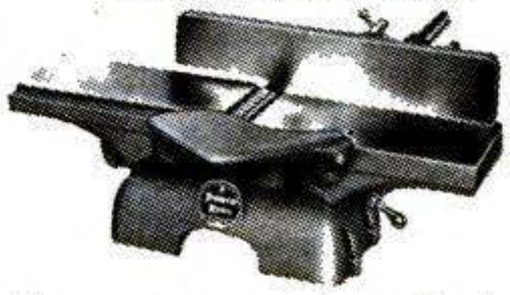
The Lowest-Priced Ball-Bearing Tilt/Arbor Saw

Yes, now you can get real "production" on your shop projects — at low cost! — zip through your saw work in a tenth the time . . . make important savings on shelves, cupboards, cabinets, furniture, home repairs, and remodeling!

The Power King #3001 — built by Atlas — has many features of high-priced saws: tilt/arbor (table *always* flat), cuts 2¼″ deep, sealed ball bearings, precision-ground grey-iron table (16″ x 25½″ with two low-cost extensions), full length double-locking rip fence. You can't beat its value—see it today!

Price F.O.B. Kalamazoo includes blade, motor rail, belt, pulley, mitre gauge, fence, splitter, guard — less motor. Extensions $3.50 each. **$39.50**



PK 4½″ Jointer-Planer

For "Factory-Smooth" Finishes

Your projects can have the smartness of professional furniture with this Power King 4½″ Ball Bearing Jointer-Planer in your shop. Saves you time and work in planing, rabbeting, tongueing, beveling. It's built extra heavy, with grey-iron base and table — precision-ground table surface — tilting fence — 3-blade steel cutter head — plus other outstanding features. A good companion tool for your circular saw and a real value at only..... **$44.75**

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These sturdy walking and riding tractors ideal for dozens of uses around the farm, orchard, garden, golf course, estate and poultry farm.

DO DOZENS OF JOBS
Shaw Du-All or Peppy-Pal tractors do many jobs quickly and easily. Plow, cultivate, harrow, mow, disk, bulldoze, spray, grind, haul and saw wood. New uses discovered every day.

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Operates on few cents an hour. Soon pays for itself in time and labor-saving plus low initial and operating costs.

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Buy direct or through your dealer! Almost anyone who has a garden can afford a Shaw Du-All or Peppy-Pal. Full year's guarantee.

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Four models, from 5 to 12½ H.P., 58 in. wheelbase, 36 in. wide, 24 in. plant clearance. Hand or electric starter. Improved steering device, brakes enclosed in differential housing shaft. Standard hitch for trailers and wagons. Plow, harrow, cultivator, cutter bar, snow plow, bulldozer available.

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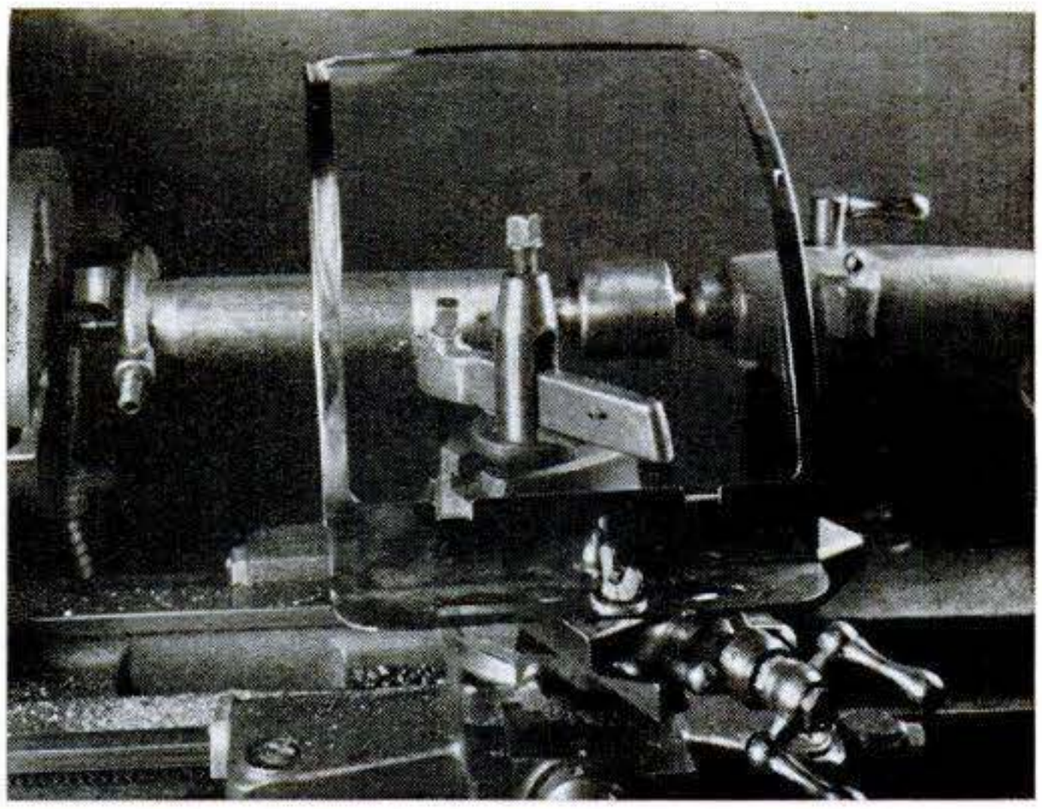
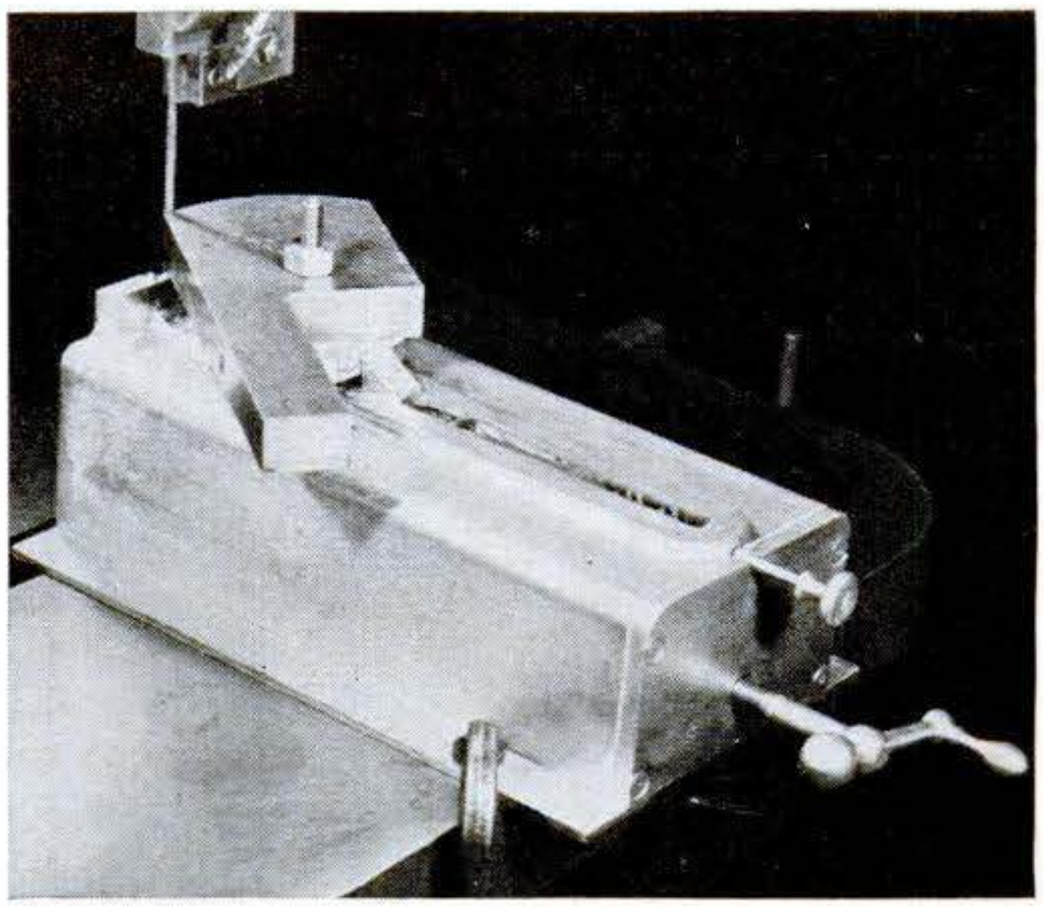
New Tools



Window Stops Flying Chips. A curved sheet of plastic in a metal frame keeps hot, flying chips away from a lathe operator. The Auto-Plane Manufacturing Co., of Detroit, prices the shield at $2.75. The lower portion of the frame has a slotted flange. This is attached to a slotted bracket by a wing nut and screw. The bracket is attached to the top of the lathe compound rest. When making adjustments or setting up new work, the shield can be swung aside. It fits lathes up to 12″ swing.



Bandsaw Fixture. Circular cuts of 5″ to 18″ radius and up to 2″ thick can be made with this automatic attachment for metal-cutting bandsaws. E. C. Atkins and Company, of Indianapolis, Ind., is the distributor. The feed mechanism is driven by a spring motor. It'll run for five minutes, automatically stopping when the work is cut. All gears and the motor are enclosed to keep out chips and dirt.

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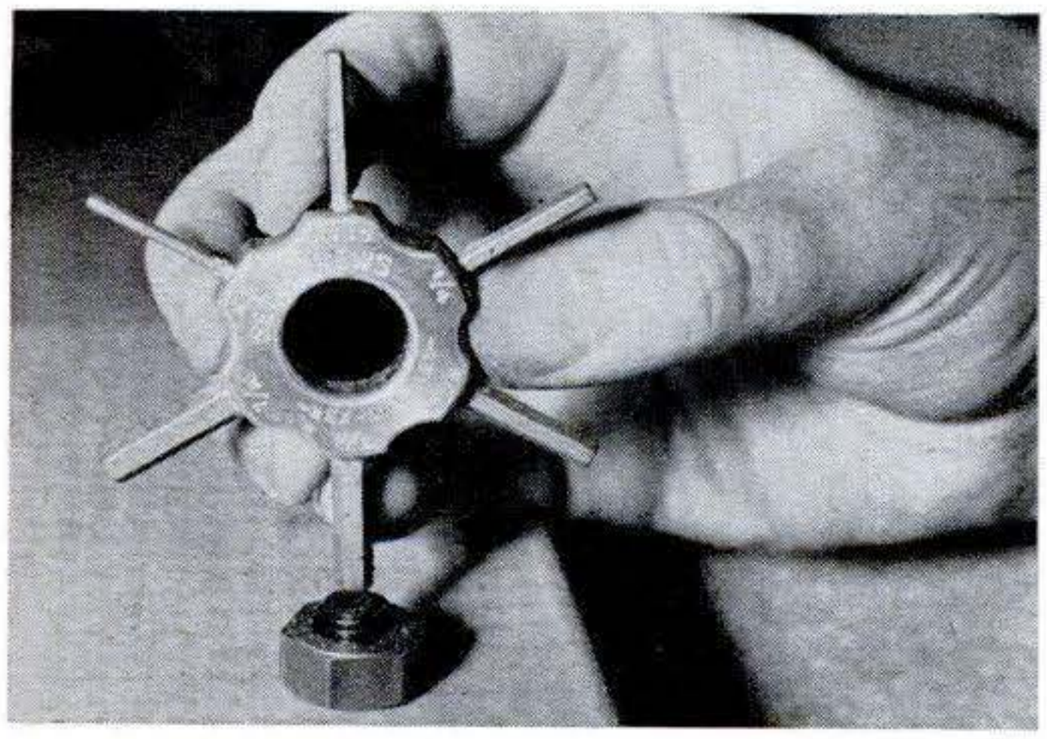
Space-Saving Power Tools. The Delta Homecraft Handi-Shop®, manufactured by the Power Tool Division of Rockwell Manufacturing Co., Milwaukee, is a compact, one-bench workshop. It's available in three models, each with a different combination of tools. The tools can be operated at the same time or individually without interfering with each other.

Each of the three models can do at least 27 workshop jobs. The model shown includes a drill press, circular saw, lathe, disk sanding and horizontal drilling attachments, line-shaft assembly, and mounting nuts and bolts. Two models require only one motor.



Six-in-One Wrench. If you find it hard to keep a set of socket-screw wrenches together, here's a single wrench that fits six sizes. The Hex-Uni-Key® is made by the Eklind Tool and Manufacturing Co., of Chicago. The center holder is cast around the deformed wrench ends, which allows maximum leverage and prevents loosening of the wrenches. Maximum diameter of the tool is 3″. Wrench sizes are marked on the tool.

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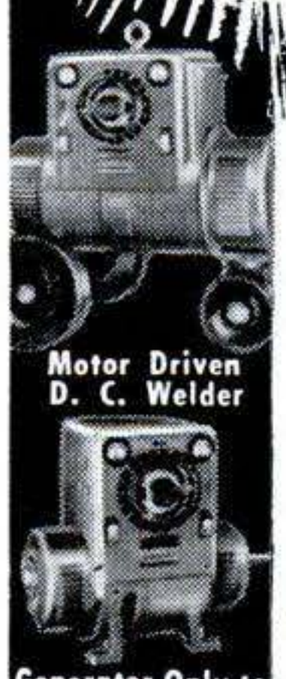

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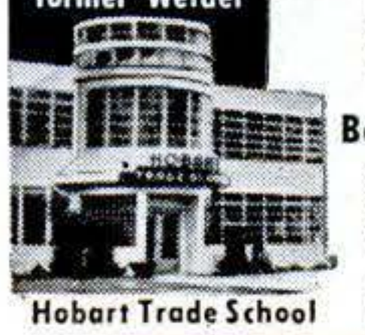
Generator Only to "Build-Your-Own"

A. C. Transformer Welder



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P.S. Last minute news & notes...

CATCHING A COLD? Try the new "hist" pills now coming on the market under various names. The "hist" in most of the trade-names derives from the anti-histamine drugs lately known to hay fever sufferers. Taken before the second sniffle, they can often knock a head cold cold. But watch out for that drowsy feeling. And be forewarned that some "hists" make some people feel depressed. Your doctor may suggest another brand - and he'll tell you that too many too late are too bad.

AUTOMATIC TRANSMISSIONS are shifting into the lowest-price field. And the trend is toward the "flow" systems of infinite gear ratios, rather than the "clunk" systems that go up and down through the usual steps. Newest is linked with the brakes to avoid "creep" while stopped on the level at a light.

FLAVORED PAPER for packaging food products with a distinctive aroma is on the way. As evidence, Monsanto Chemical Co. puts out this news on paper that smells like vanilla. The appetizing flavors, long used in the cookies, are now mixed with the pulp or rolled into the finished paper.

NEW CARS: Most of the new models are what the industry calls "face lifts." That is, the same old body dies with a bigger smile. A couple of makers will do a strip-tease for low-end sales; one with a stripped-down version of the current car, the other with a junior model that peels off the pounds to slim down the price.

RESEARCH-STORY AWARDS by the National Society for Medical Research went to LIFE for the article on Blue Baby Research produced by its science staff; and to Herbert Yahraes for his article (with pictures by W.W. Morris) in Popular Science called, "Science Tries You Out on the Dog." Remember it in the February issue? This is the second time Herb Yahraes has rung up an award for his excellent science reporting. The first was for "Static from the Stars" also in PS.

FORGET COLOR TV. The television set you get for Christmas won't be made obsolete by the full-color lookies for a long time yet. Too many technical problems, too many monochrome sets in use, and too high costs will keep the red off the air until the TV programs get out of it.

The Editors

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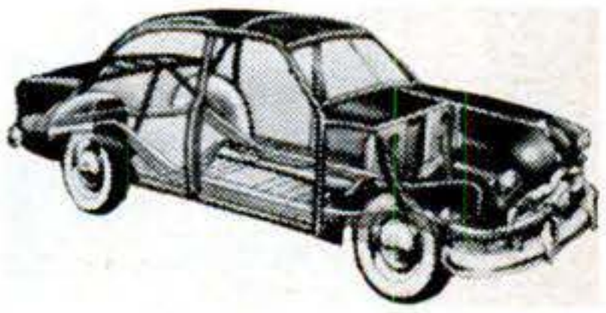
'50 FORD 50 WAYS NEW!

NEW, NEW, NEW, THROUGH AND THROUGH!

New front seat spring construction gives non-sag support . . . new foam rubber cushion for lasting comfort.

New luxury upholstery and interior trim tastefully selected to harmonize with new '50 Ford body colors.

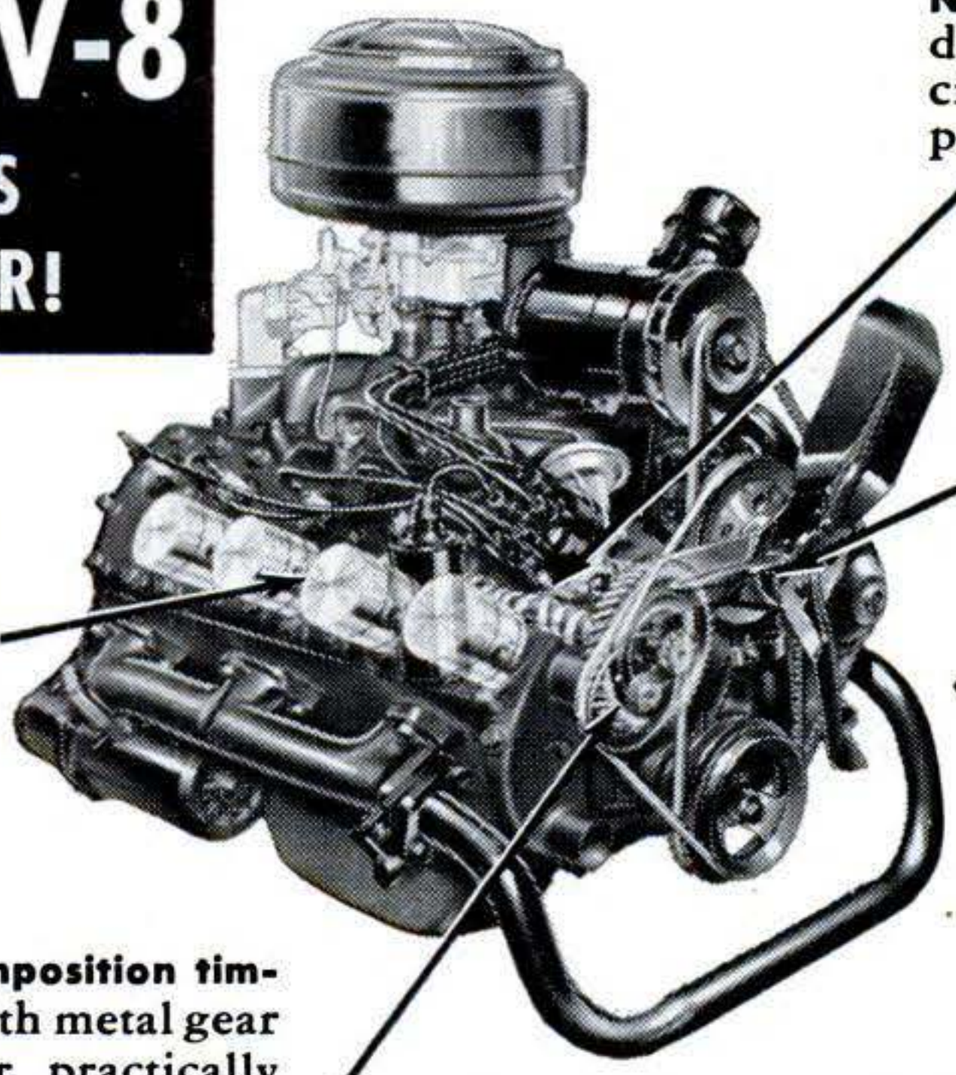
New, effortless Push-Button Door Handles. New Rotary Door Latches with spring-loaded nylon-plastic shock absorbers in striker plates.



New bracing scientifically designed for greater strength and low weight. New sealing and insulation at 41 points give new weather-tight snugness and quiet comfort.

Dozens of other new body and styling features!

NEW ENGINEERING ADVANCEMENTS MAKE FORD'S 100 h.p. V-8 QUIET AS A WHISPER!



New cast camshaft features newly designed cam contours with special ramp for quiet, even flow of power at all speeds.

New three-blade fan is scientifically designed for increased air flow with minimum noise and power loss. New accessories drive, with two narrow V-belts over 3 pulleys provides quiet, efficient drive for fan, generator, and water pumps.

New super-fitted pistons of tin-plated aluminum alloy. Special steel struts in cam ground skirts control expansion, permit close clearances for extra quiet, longer life.

New laminated composition timing gear meshes with metal gear on crankshaft for practically noiseless operation. Gears are wide-faced helical cut for smooth, positive drive.

Take a GOOD look... Take a GOOD ride

AT YOUR FORD DEALER'S

There's a Ford in your future— with a future built in!

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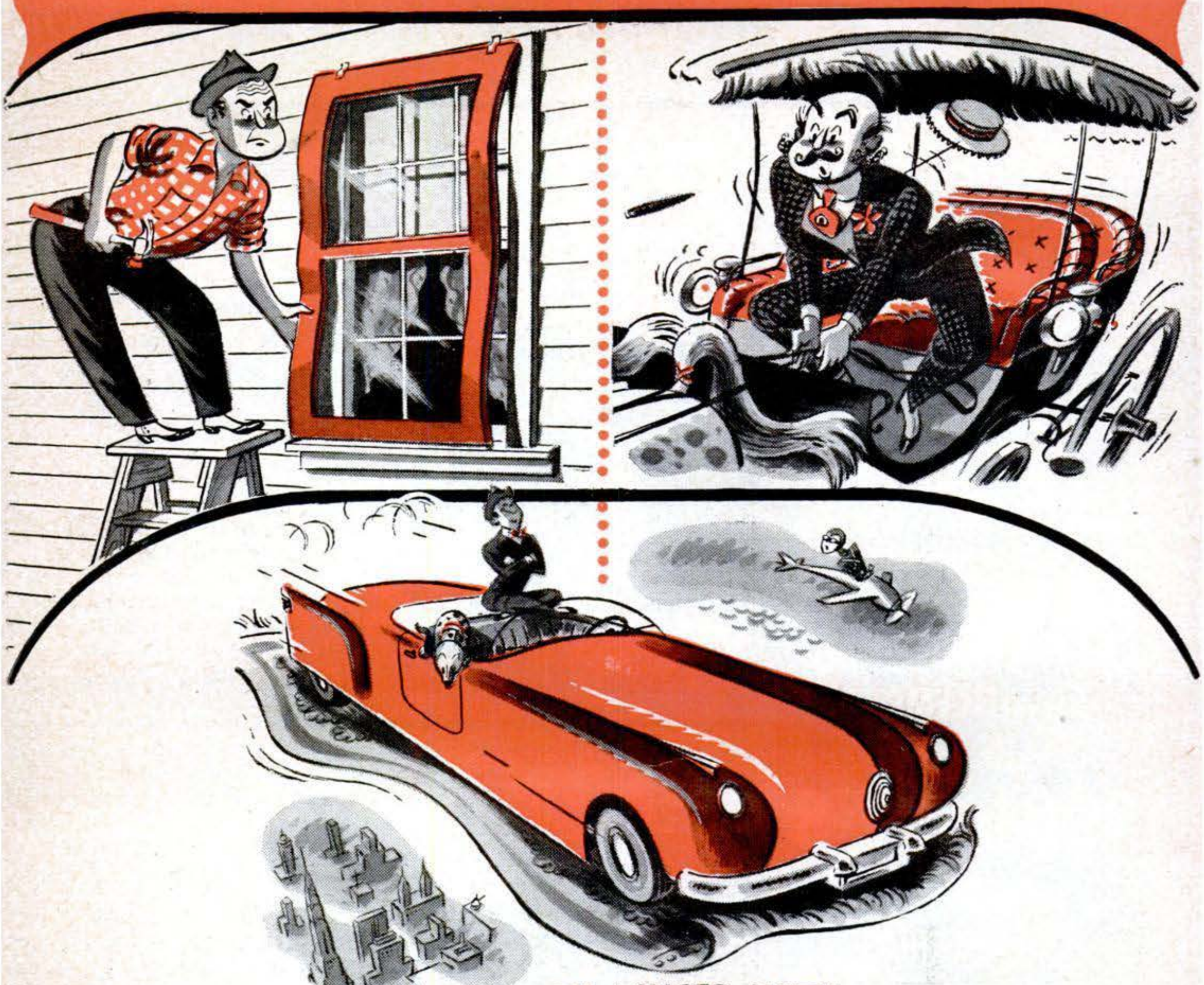
IF PLANS FOR THE WINTER TURN OUT LIKE THIS...IT'S TIME FOR A REFITTING...

and

IF YOUR CAR FEELS LIKE THIS... IT'S TIME FOR **MARFAK** CHASSIS LUBRICATION



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GRASP THIS OPPORTUNITY TODAY! It's too good to miss! Fill out the Postcard at right and mail today for full details. No postage is required if mailed in the U. S. A. FREE sample of FLOK-KRAFT covered material and hundreds of useful and profitable IDEAS will be sent right to your door. No one will call on you. Do it NOW—be first!

"Received the flok-kraft outfit and everyone that saw it is very enthused. I only had it about thirty minutes and got an order for a hundred dollar job and promises of several more." Mr. C. H., Maryland.

"Got $52.50 for those 7 trunk interiors for about 4 hours work. $7.50 per trunk." J. O., Missouri.

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"...pleased with your course and I'm being swamped with work to do." W. F., Pa.

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Hastings Rings are designed especially for replacement service. So ask your motor serviceman for Hastings—the replacement ring that *stops* oil-pumping, *checks* cylinder wear and *restores* performance. It's the best money you can spend on your car.

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STEEL-VENT PISTON RINGS

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TOUGH on Oil-Pumping
GENTLE on Cylinder Walls

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